Palaeontological Impact Assessment for the rezoning and development of a school and hospital on Farm 219, Hartenbos, for Hartland Lifestyle Estate, Western Cape Province

Desktop Study (Phase 1)

Subcontracted by

ACRM (Pty) Ltd

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1. Executive Summary

A Palaeontological Impact Assessment was requested for the proposed rezoning and establishment of a hospital and on Farm 219, Hartenbos, Western Cape Province. The applicant is Hartland Lifestyle Estate (Pty) Ltd, and the landowner is Vaale Vallei Eiendomme (Pty) Ltd.

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 site lies on the potentially very highly sensitive Enon Formation (Uitenhage Group) according to SAHRIS only. It should be noted that this formation is used as a catchall for Cretaceous and younger sediments that are not sufficiently distinct enough to assign to any other formation. The lithology includes cobbles, conglomerates, sandstones, and transported debris. Hence it is unlikely that any fossils of scientific value would be recovered. Nonetheless, 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 or drilling activities have commenced. Since the impact will be LOW, as far as the palaeontology is concerned, the project should be authorised.

ASPECT	SCREENING TOOL SENSITIVITY	VERIFIED SENSITIVITY	OUTCOME STATEMENT/ PLAN OF STUDY	RELEVANT SECTION MOTIVATING VERIFICATION
Palaeontology	Very High	Low	Palaeontological Impact Assessment	Section 7.2. SAHRA Requirements

2. **Declaration of independence and summary of expertise**.

a. Declaration

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by ACRM (Pty) Ltd, 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: 

b. Expertise

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, mASSAf, PSSA
Experience: 36 years research and lecturing in Palaeontology; over 28 years PIA studies and over 450 projects completed.

c. Specialist declaration of independence and statement of objectivity for the assessment.

Declaration of Independence
I, Marion Bamford, declare that –
General declaration:

- I act as the independent palaeontology practitioner in this application,
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant,
- I declare that there are no circumstances that may compromise my objectivity in performing such work,
- I have expertise in conducting palaeontological impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations, and all other applicable legislation,
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application,
- I have no, and will not engage in, conflicting interests in the undertaking of the activity,
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority,
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties

and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application,
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct,
- I will perform all other obligations as expected from a heritage practitioner in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

- I do not have and will not have any vested interest (either business, financial, personal, or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations.

d. **Summary of the specialist's expertise**

I, Marion Bamford, am a professional Palaeontologist with a PhD in Palaeontology (Wits University, 1990). I have more than 35 years of experience in palaeontological research and have published over 210 papers in peer-reviewed journals and published more than 14 scholarly book chapters. I review manuscripts for international and local journals and also review funding proposals for international funding bodies. Currently I am the Director of the Evolutionary Studies Institute, the only palaeontological institute in Southern Africa.

I have completed more than 450 palaeontological impact assessments (desktop and site visit studies) in the last 29 years for a variety of projects (solar energy projects, wind energy projects, powerlines, roads, infrastructure, housing, and retail projects and from all over South Africa. I have been subcontracted by over 30 different companies. From my own projects and training provided by me and other staff in the ESI for Palaeontological Impact Assessments, I am familiar with the legislation.

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3. Project Background

A Palaeontological Impact Assessment was requested for the proposed rezoning and establishment of a hospital and school on Farm 219, Hartenbos, Western Cape Province (Figures 1-4). The applicant is Hartland Lifestyle Estate (Pty) Ltd, and the landowner is Vaale Vallei Eiendomme (Pty) Ltd.

A Palaeontological Impact Assessment was requested for the Hartland Lifestyle Estate project. 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. The minimum requirements for reporting are listed in Table 1.

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). Includes the requirements from GNR Appendix 6 of GN 326 EIA Regulation 2017.

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
ai	Details of the specialist who prepared the report,	Section 2
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Section 2
b	A declaration that the person is independent in a form as may be specified by the competent authority	Section 2
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 3
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 6
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 4
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 6
g	An identification of any areas to be avoided, including buffers	N/A

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
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 7
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 8
k	Any mitigation measures for inclusion in the EMPr	Section 10, 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 10, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	Section 8
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 8, 10
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

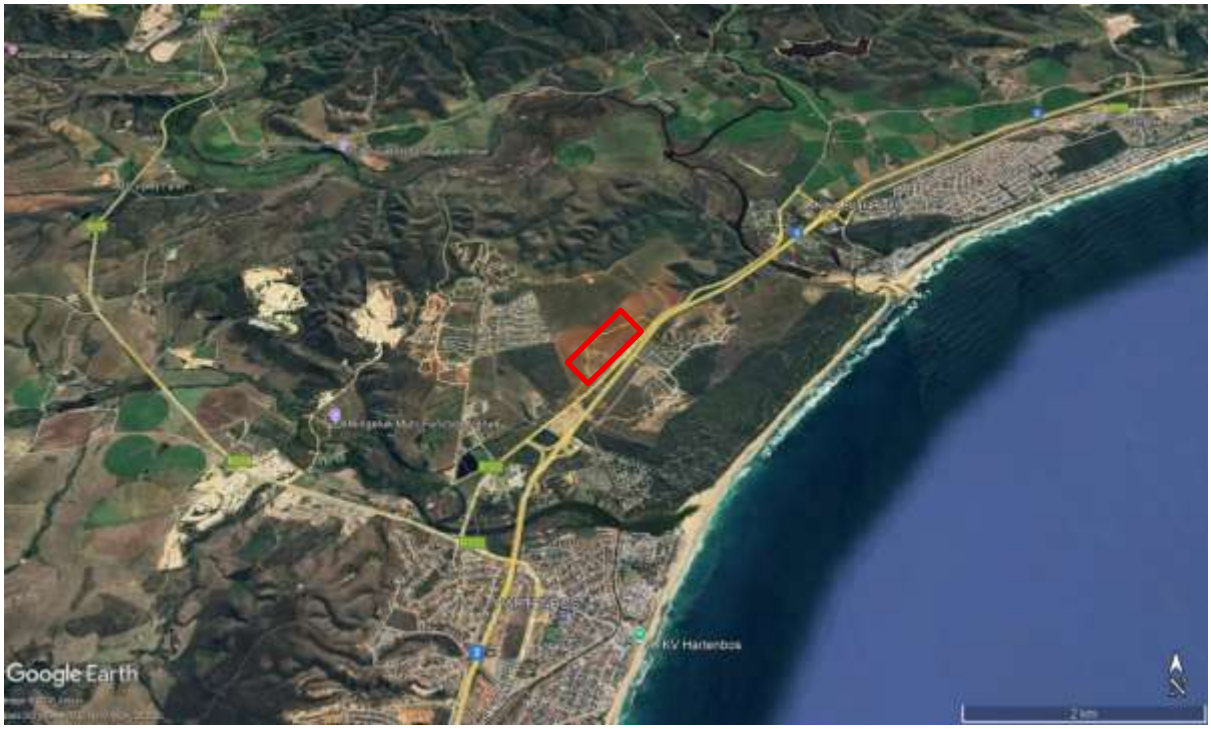

Figure 1: Google Earth map of the general area to show the relative land marks. The Hartland Lifestyle Estate project is shown by the red polygon.

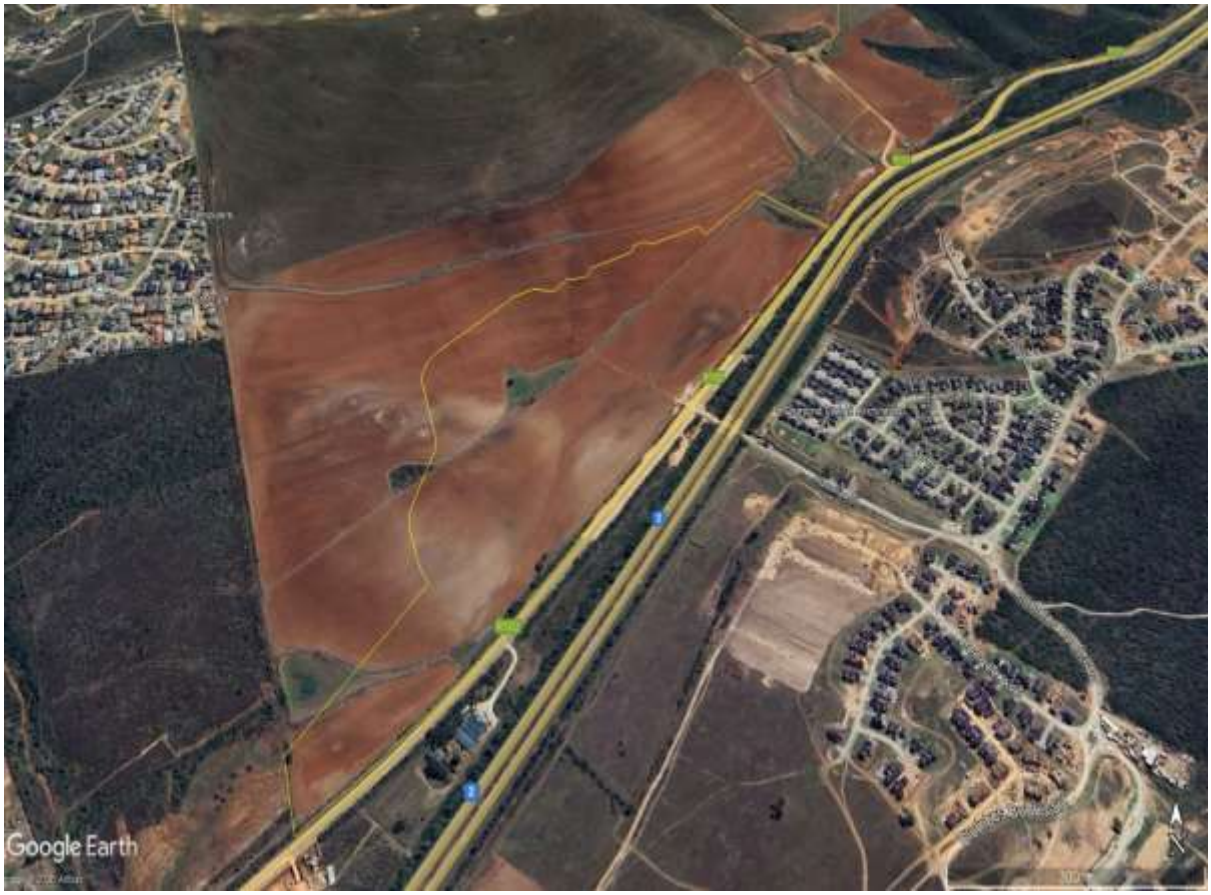

Figure 2: Google Earth Map of the proposed site for Hartland Lifestyle Estate new hospital and school shown within the yellow outline.

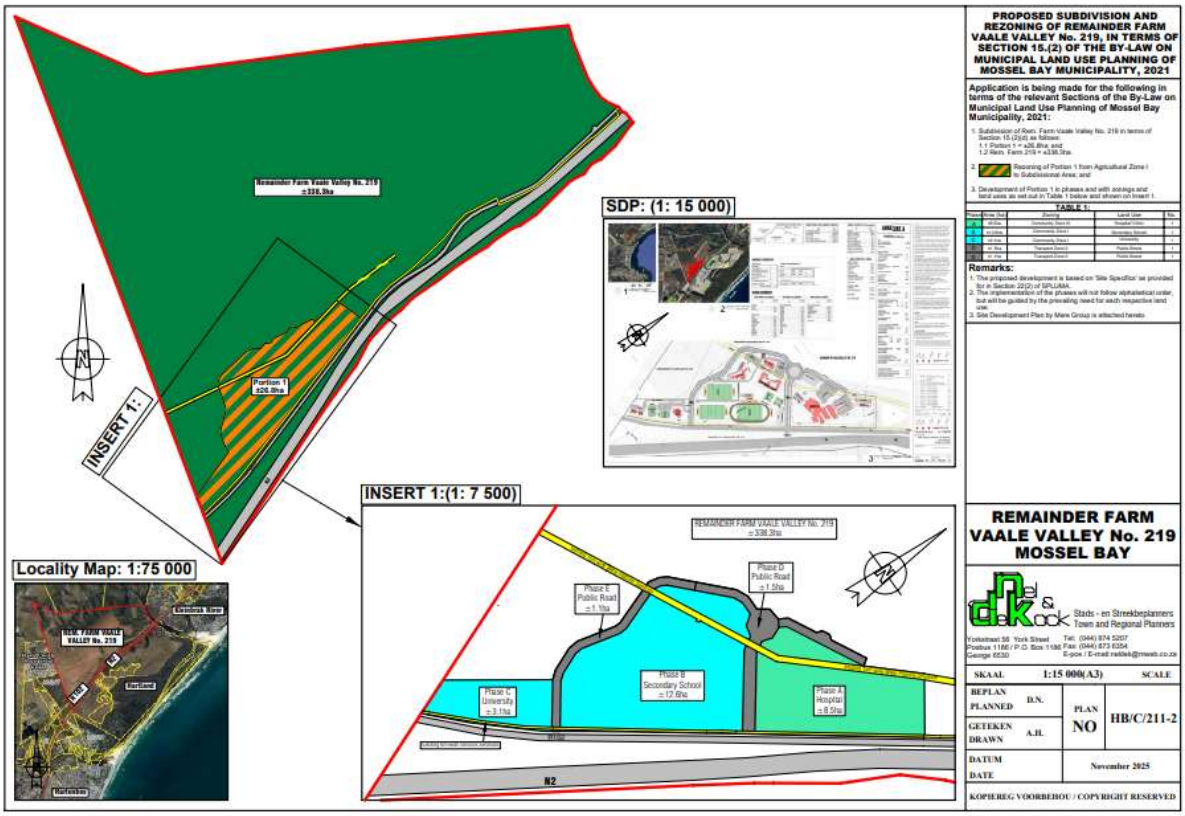

Figure 3: Land layout map for the Hartland Lifestyle Estate project.

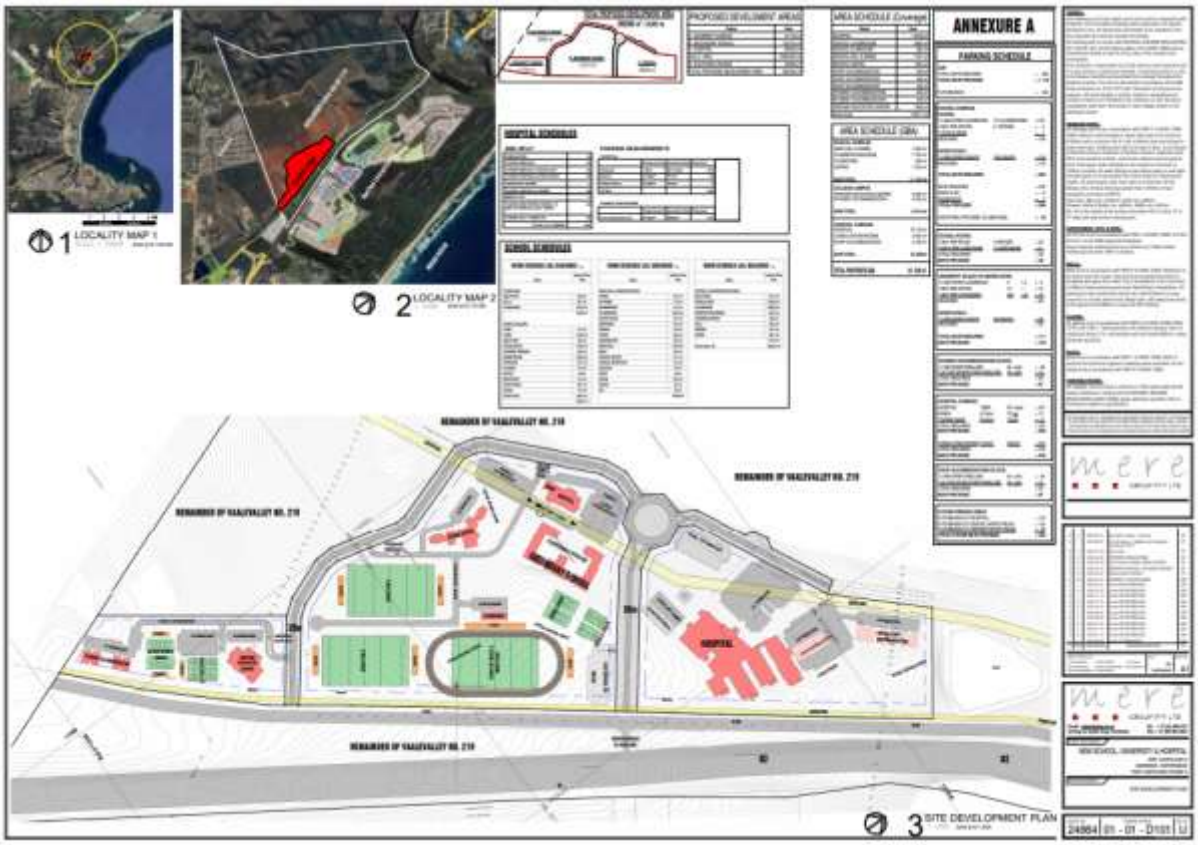

Figure 4: Layout map of the new hospital, school, and associated infrastructure.

4. 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 HWC.
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 include records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases; eg https://sahris.sahra.org.za/map/palaeo
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' representativity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

5. Geology and Palaeontology

i. Project location and geological context

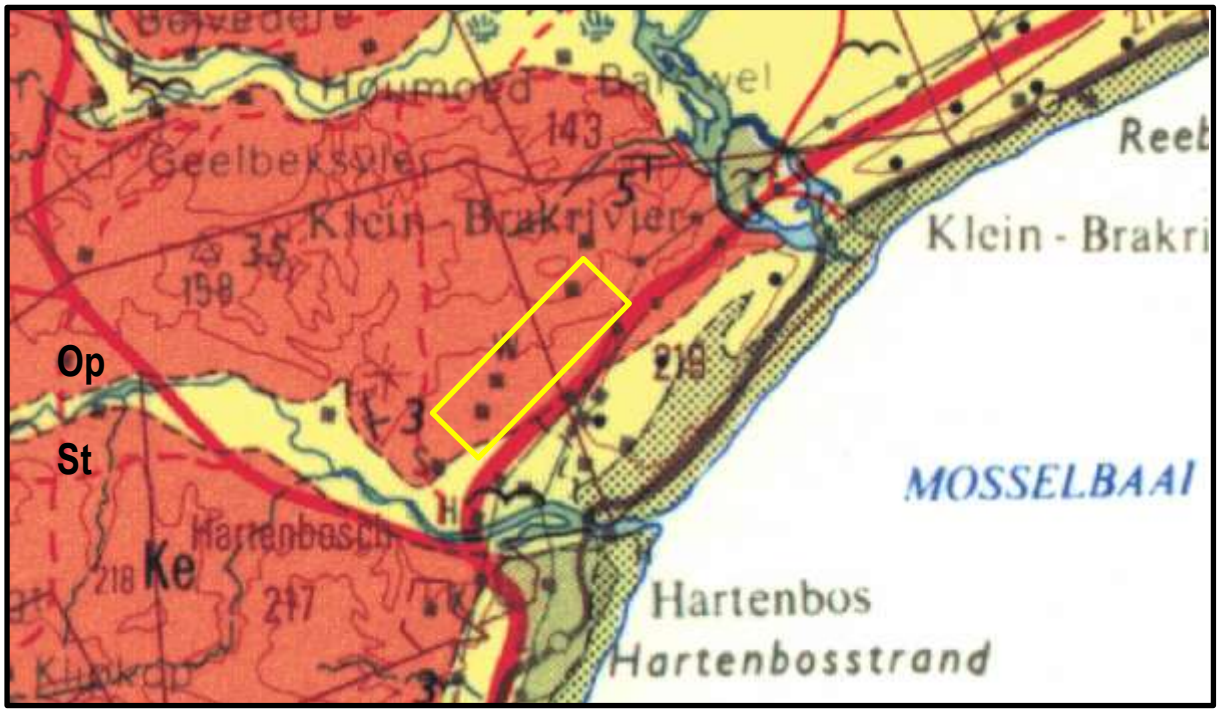

Figure 5: Geological map of the area around the Hartland Lifestyle Estate project site that is indicated by the yellow rectangle. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 3322 Oudtshoorn.

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

Symbol	Group/Formation	Lithology	Approximate Age
Qg	Quaternary	Alluvium, sand, calcrete	Quaternary ca 1.0 Ma to Present
Ke	Enon Fm, Uitenhage Group	Conglomerate, mudstone, sandstone	Late Jurassic
St	Goudini Fm, , Nardouw Subgroup, Table Mountain Group, Cape SG (was Tshando)	Sandstone (red, brown)	Silurian
Op	Peninsular Fm, Table Mountain Group, Cape SG	Sandstone	Ordovician

The project lies in the southern part of South Africa where a series of Mesozoic-aged basins extends out to the ocean (Figure 5). Underlying these sediments are older rocks of Cape Supergroup, and younger sands and alluvium have been deposited in the valleys.

Several basins developed along the margin of the newly formed African continent during the Jurassic and Cretaceous in response to regional extension associated with the break-up of Gondwana. The Algoa Basin is the largest of the half-graben-type basins and comprises the Uitenhage Group (Shone, 2006). The lowermost Enon Formation consists of large sub-rounded pebbles and cobbles derived from the older Cape Supergroup rocks and in some exposures, these are tightly packed. Elsewhere there are lenses of white to buff-coloured silty sandstone. Overlying and inter-digitating with the Enon Formation is the primarily terrestrial Kirkwood Formation and the marine Sundays River Formation. The former comprises fluvial sediments whereas the latter has a range of estuarine (Shone, 2006), fluvial and marine sediments.

ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figures 6-7. The site for development is in the potentially very extremely sensitive Enon Formation (red).

According to Shone (2006; p. 543), the Enon Formation contains a few disarticulated and abraded bone fragments of unknown vertebrates, and a few pieces of charred fossil wood. The latter, however, could be derived from re-worked Cape Supergroup sediments. The fragments are insufficient to date the Enon Formation and probably younger, indeterminate sediments are lumped in the Enon Formation in the geological maps.

From the SAHRIS map above the area is indicated as very extremely sensitive (red) but according to the geology, this is unlikely because it is composed of a mixture of clasts and matrix. Photographs provided by the Heritage specialist (Figures 5-8) confirm the observations of the geologist (Shone, 2006).

Since the likelihood that there are scientifically significant fossils in the project footprint is LOW, the upgrade project is unlikely to impact the palaeontological heritage.

Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/ YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 6: SAHRIS palaeosensitivity map for the site for the proposed development for the Hartland Lifestyle Estate on Farm 219, Hartenbos shown within the yellow polygon.

Figure 7: DFFE screening map for the Hartland Lifestyle Estate project.

6. 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 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

Table 3b: Impact Assessment

PART B: Assessment		
SEVERITY/NATURE	**H**	-
	M	-
	L	Soils do not preserve fossils; so far there are no records from the Enon Fm of plant or animal fossils in this region, so it is very unlikely that fossils occur on the site. Most excavation is likely to be into alluvial valley fill deposits. The impact would be negligible
	L+	-
	M+	-
	H+	-
DURATION	**L**	-
	M	-
	H	Where manifest, the impact will be permanent.
SPATIAL SCALE	**L**	Since the only possible fossils within the area would be transported and fragmented fossils with the stones and cobbles, the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	**H**	**-**
	M	**-**
	L	It is extremely unlikely that any fossils would be found in the loose soils and sands that cover the area or in the older strata that may be excavated at depth. Nonetheless, a Fossil Chance Find Protocol should be added to the eventual EMPr.

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 the rocks are from mixed sources and have been transported so do not contain recognisable or scientifically useful fossils. Furthermore, the material to be excavated is likely to be mostly sand and this does not preserve significant fossils. Since there is a small chance

that fossils from the Enon Formation may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is low.

7. 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, shales and sands are typical for the country and only some might contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve significant fossils.

8. Recommendation

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any significant fossils would be preserved in the overlying soils of the Quaternary. The whole area has been cleared of natural vegetation and rocks decades ago and ploughed and planted with crops. The land surface is highly, modified and no fossils would remain on the surface. There is a small chance that fossils may occur below the soil cover in the conglomerate and sands of the Enon Formation (Uitenhage Group) so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once excavations have 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, as far as the palaeontology is concerned, so the project should be authorised.

ASPECT	SCREENING TOOL SENSITIVITY	VERIFIED SENSITIVITY	OUTCOME STATEMENT/ PLAN OF STUDY	RELEVANT SECTION MOTIVATING VERIFICATION
Palaeontology	Very High	Low	Palaeontological Impact Assessment	Section 7.2. SAHRA Requirements

9. References

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

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.

McLachlan, I.R., McMillan, I.K., 1976. Review and stratigraphic significance of southern Cape Mesozoic palaeontology. Transactions of the Geological Society of South Africa 79, 197–212.

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.

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Roberts, D.L., Botha, G.A., Maud, R.R., Pether, J., 2006. Coastal Cenozoic deposits. 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 605-628.

10. Fossil 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 discard must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone, or trace fossils) 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 10). 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 a HWC permit must be obtained. Annual reports must be submitted to HWC 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 HWC 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.

11. **Appendix A** – Examples of fossils from the Uitenhage Group

Figure 10: Photographs of fossil bones from the overlying Kirkwood Formation to assist the on-site responsible person.