PALAEONTOLOGICAL DESKTOP ASSESSMENT OF THE PROPOSED RESORT DEVELOPMENT ON PORTION 18 OF FARM 387, GORDONIA RD, Z.F. MCCAWU DISTRICT MUNICIPALITY, !KHEIS LOCAL MUNICIPALITY

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Prepared by:

BANZAI ENVIRONMENTAL (PTY) LTD

EXECUTIVE SUMMARY

UBIQUE Heritage Consultants appointed Banzai Environmental (Pty) Ltd to undertake a Palaeontological Impact Assessment assessing the palaeontological impact of the proposed resort on Portion 18 of Farm 387, Gordonia RD, Z.F. McCawu District Municipality, !Kheis Local Municipality, Northern Cape. According to the National Heritage Resources Act (Act No 25 of 1999, Section 38), a palaeontological impact assessment is required to identify the occurrence of fossil material within the proposed development footprint and to calculate the impact of the development on the palaeontological resources.

The geology of the proposed development footprint is underlain by the Groblershoop Formation of the Brulpan Group (Namaqua–Natal Province) as well as the Kalahari Group. According to the SAHRIS PalaeoMap the Groblershoop Formation, Brulpan Group (Namaqua–Natal Province) has a Zero Palaeontological sensitivity and the Kalahari Group has a Low Palaeontological significance. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. It is considered that the development of the proposed Development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area.

In the event that fossil remains are discovered during any phase of construction, either on the surface or unearthed by fresh excavations, the ECO in charge of these developments ought to be alerted immediately. These discoveries ought to be protected (preferably *in situ*) and the ECO must report to SAHRA so that appropriate mitigation (*e.g.* recording, collection) can be carry out by a professional paleontologist.

Preceding any collection of fossil material, the specialist would need to apply for collection permit from SAHRA. Fossil material must be curated in an approved collection (museum or university) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

1	Contents	
2	INTRODUCTION	. 1
2	LEGISLATION	. 2
3	OBJECTIVE	. 5
4	GEOLOGICAL AND PALAEONTOLOGICAL HERITAGE	. 5
4	PALAEONTOLOGY	.6
4	.2 GEOLOGY	.6
5	GEOGRAPHICAL LOCATION OF THE SITE	. 8
6	METHODS	. 8
6	ASSUMPTIONS AND LIMITATIONS	.8
7	Impact Rating System	. 9
8	FINDINGS AND RECOMMENDATIONS	13
9	REFERENCES	14
10	QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR	۱5

2 INTRODUCTION

EnviroAfrica has appointed UBIQUE Heritage Consultants which in turn appointed Banzai Environmental (Pty) Ltd to undertake a Palaeontological Impact Assessment assessing the palaeontological impact of the proposed resort development site on Portion 18 of Farm 387, Gordonia RD, Z.F. McCawu District Municipality, !Kheis Local Municipality, Northern Cape. The proposed project will consist of the development as well as upgrading and restoration of feasible tourism and recreational facilities.

Currently, 3 to 5 thatched roof chalets, a thatched roof entrance, two mobile home accommodation blocks, numerous tented chalets, a swimming pool and picnic area with a restaurant/ bar have been completed. Infrastructure have been constructed and includes a paved entrance and site roads, streetlights, ablution and laundry facilities, and septic tanks. Access and internal roads, in addition to other building areas have been cleared. Future development will comprise the construction of recreational facilities such as an amphitheatre, additional accommodation, a solid waste facility as well as a double-story 16-bed hotel on the eastern bank of the Orange River to the north-west of the property. A quarter mile racing strip and spin track with a paved parking area on the south-eastern side of the property and separate access from the N8 is also planned.

The bulk development for the holiday resort will be on the eastern bank of the Orange river and will comprise an area of about 5 to 10 ha. The rest of the farm will be utilised as a game farm. The eastern and northern boundary of the farm comprises of a 2,4 m game fence. The owner plans to introduce game on the farm that will serve as a private reserve for tourists. The southern boundary of the farm consists of a normal 1,2 m mesh wire fence which lies adjacent to the N8 national road from Groblershoop to Kimberley. Future developments on the eastern side of the farm might be possible. The entire farm is 360 ha in extent.

Construction work on the resort has already begun and much of the terrain of the study area has been disturbed. Eskom is in the process of constructing a new power line which runs from the N8 in a northerly direction all along the eastern boundary and turns towards the Orange river in a northwestern direction. The new power line then runs through the resort development on the river bank.

Application for environmental authorisation for the following activities in terms of NEMA EIA Regulations 2014:

- Government Notice R327 (Listing Notice 1): Activity No. 12, 19, 27
- Government Notice R324 (Listing Notice 3): Activity No. 6, 11, 12, 14

The activities that have been completed or have commenced (Section 24G Application) will constitute the following listed activities in terms of the NEMA EIA Regulations 2014:

- Government Notice R327 (Listing Notice 1): Activity No. 12, 19, 27
- Government Notice R324 (Listing Notice 3): Activity No. 6, 12, 14

Construction of the resort had already commenced at the time of our assessment, and much of the terrain on the site has been disturbed by construction.

2.1 LEGISLATION

NATIONAL HERITAGE RESOURCES ACT (ACT 25 OF 1999)

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include "all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens".

Palaeontological heritage is unique and non-renewable and is protected by the NHRA. Palaeontological resources may not be unearthed, moved, broken or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This Palaeontological Desktop Assessment forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to **Section 38 (1)**, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- the construction of a bridge or similar structure exceeding 50 m in length;
- any development or other activity which will change the character of a site --

(exceeding 5 000 m^2 in extent; or

- involving three or more existing erven or subdivisions thereof; or
- involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- the re-zoning of a site exceeding 10 000 m² in extent;

or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.



Figure 1: The proposed resort development site on Portion 18 of Farm 387, Gordonia RD, Z.F. McCawu District Municipality, !Kheis Local Municipality, Northern Cape. The development site is approximately 1.7km north of Groblershoop. Map provides by EnviroAfrica.

3 OBJECTIVE

The objective of a Palaeontological Desktop Assessment is to determine the impact of the development on potential palaeontological material at the site. According to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports" the aims of the palaeontological impact assessment are: 1) to identify the palaeontological importance of the exposed and subsurface rock formations in the development footprint 2) to evaluate the palaeontological importance of the formations 3) to determine the impact of the development on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate damage to fossil heritage.

When a palaeontological desktop study is compiled, the potentially fossiliferous rocks present within the study area are established utilizing 1:250 000 geological maps. The topography of the development area is identified by using 1:50 000 topography maps as well as Google Earth Images of the development area. Possible fossil heritage within of the development area is obtained from previous palaeontological impact studies in the same region as well as the PalaeoMap from SAHRIS and thus the palaeontological importance of the rock units are calculated. The possible impact of the proposed development footprint on local fossil heritage by: 1) the palaeontological importance of the rocks and 2) the type of the development footprint and 3) quantity of bedrock excavated.

When rocks of moderate to high palaeontological sensitivity are present within the study area, a fieldbased assessment by a professional palaeontologist is required. Based on the desktop data and field assessment the impact significance of the planned development is measured with recommendations for further studies or mitigation. Usually, destructive impacts on palaeontological heritage only occur during construction. The excavations will transform the current topography and may destruct or permanently seal-in fossils at or below the ground surface. Fossil Heritage will then no longer be accessible for scientific research.

4 GEOLOGICAL AND PALAEONTOLOGICAL HERITAGE

The geology of the proposed development footprint is underlain by the Groblershoop Formation of the Brulpan Group (Namaqua–Natal Province) as well as the Kalahari Group (Fig 2).

4.1 PALAEONTOLOGY

Quaternary fossil assemblages are generally rare and low in diversity and occur over a wide-ranging geographic area. These fossil assemblages may in some cases occur in extensive alluvial and colluvial deposits cut by dongas. In the past palaeontologists did not focus on Caenozoic superficial deposits although they sometimes comprise of significant fossil biotas. Fossils assemblages may comprise of mammalian teeth, bones and horn corns (including hyena dens and owl pellets), reptile skeletons and fragments of ostrich eggs. Microfossils, terrestrial mollusc shells and freshwater stromatolites are also known from Quaternary deposits. Plant material such as foliage, wood, pollens and peats are recovered as well as trace fossils like vertebrate tracks, burrows, termitaria (termite heaps/ mounds) and rhizoliths (root casts).

These sediments is Palaeontology poorly studied.

4.2 GEOLOGY

Quaternary Ceanozoic superficial deposits

The Tertiary to Quaternary Ceanozoic superficial deposits (represented on Geological maps by Qs,) consist of aeolian sand, alluvium (clay, silt and sand deposited by flowing floodwater in a river valley/ delta producing fertile soil), colluvium (material collecting at the foot if a steep slope), spring tufa/tuff (a porous rock composed of calcium carbonate and formed by precipitation from water) and cave, lake, spring and pan deposits, peats, pedocretes or duricrusts (calcrete, ferricrete), soils and gravels. Rock Types and Age:

Namaqua-Natal Metamorphic

The Namaqua-Natal Metamorphic Province consists of a large number of subunits. These Early to Mid Proterozoic (Mokolian) (approximately 2-1 Ga years old) granite-gneiss basement rocks is unfossiliferous because they are igneous in origin or too highly metamorphosed.

Table 1: Explanation of geology, lithology and approximate ages in the proposed developmentfootprint.

Group/Formation	Lithology	Approximate Age
Kalahari Group	Sand, limestone	Cenozoic
Brulsands Group,	Arenaceous; quartzite, shale,	ca 2000-1750 Ma
	greywacke	



Figure 5. The surface geology of the resort development on Portion 18 of Farm 387, Gordonia RD, approximately 1.7km north of Groblershoop. The development sit is primary underlain by rocks of the Kalahari Group and Groblershoop Formation of the Brulpan Group. Map drawn QGIS Desktop 2.18.14. The Orange River is represented by the maroon colour in the map).

5 GEOGRAPHICAL LOCATION OF THE SITE

The proposed development site is on Portion 18 of Farm 387, Gordonia RD, is approximately 1.7km north of Groblershoop. The site is can be accessed just after the Orange River bridge on the north-western side of the N8.

Site access co-ordinates are 28° 52' 37.13" S, 21° 59' 24.25" E.

6 METHODS

A desktop study was conducted to assess the potential risk to palaeontological material (fossils and trace fossils) in the proposed area of development. When writing the desktop report to assess the proposed development footprint, topographical and geological maps are utilized as well as aerial photos (using Google Earth, 2017/2018) as well as other impact assessment reports from the same area.

6.1 ASSUMPTIONS AND LIMITATIONS

The accurateness of Palaeontological Desktop Impact Assessments is reduced by old fossil databases that do not always include relevant locality or geological formations. The geology in various remote areas of South Africa may be less accurate because it is based entirely on aerial photographs. The accuracy of the sheet explanations for geological maps is inadequate as the focus was never intended to be on palaeontological material.

The entire South Africa has not been studied palaeontologically. Similar Assemblage Zones but in different areas, might provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations generally assume that unexposed fossil heritage is present within the development area. Thus, the accuracy of the Palaeontological Impact Assessment is improved by a field-survey.

7 Impact Rating System

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the following project phases:

- Construction
- Operation
- Decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact the following criteria is used:

Table 1: The rating system

NATURI	NATURE			
Include	Include a brief description of the impact of environmental parameter being assessed in the context			
of the p	roject. This criterion includes a b	prief written statement of the environmental aspect being		
impacte	d upon by a particular action or a	activity.		
The Nat	ure of the Impact is the possible	destruction of fossil heritage		
GEOGR	GEOGRAPHICAL EXTENT			
This is d	efined as the area over which the	e impact will be experienced.		
1	Site	The impact will only affect the site.		
2	Local/district	Will affect the local area or district.		
3	Province/region	Will affect the entire province or region.		
4	International and National	Will affect the entire country.		
PROBABILITY				
This describes the chance of occurrence of an impact.				
1	<mark>Unlikely</mark>	The chance of the impact occurring is extremely low		
		(Less than a 25% chance of occurrence).		

2	Possible	The impact may occur (Between a 25% to 50% chance of
		occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75%
		chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance
		of occurrence).

Table 1 Continues

DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result		
of the p	roposed activity.	
1	Short term	The impact will either disappear with mitigation or will
		be mitigated through natural processes in a span shorter
		than the construction phase (0 – 1 years), or the impact
		will last for the period of a relatively short construction
		period and a limited recovery time after construction,
		thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the
		construction phase but will be mitigated by direct human
		action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the
		entire operational life of the development, but will be
		mitigated by direct human action or by natural processes
		thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory.
		Mitigation either by man or natural process will not
		occur in such a way or such a time span that the impact
		can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the
		system/component in a way that is barely perceptible.

2	Medium	Impact alters the quality, use and integrity of the
		system/component but system/component still
		continues to function in a moderately modified way and
		maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/
		component and the quality, use, integrity and
		functionality of the system or component is severely
		impaired and may temporarily cease. High costs of
		rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the
		system/component and the quality, use, integrity and
		functionality of the system or component permanently
		ceases and is irreversibly impaired. Rehabilitation and
		remediation often impossible. If possible rehabilitation
		and remediation often unfeasible due to extremely high
1		

Table 1 Continues

REVERSIBILITY			
This des	This describes the degree to which an impact can be successfully reversed upon completion of the		
propose	ed activity.		
1	Completely reversible	The impact is reversible with implementation of minor	
		mitigation measures.	
2	Partly reversible	The impact is partly reversible but more intense	
		mitigation measures are required.	
3	Barely reversible	The impact is unlikely to be reversed even with intense	
		mitigation measures.	
4	Irreversible	The impact is irreversible and no mitigation measures	
		exist.	
IRREPLACEABLE LOSS OF RESOURCES			
This describes the degree to which resources will be irreplaceably lost as a result of a proposed			
activity.			

1	No loss of resource	The impact will not result in the loss of any resources.		
2	Marginal loss of resource	The impact will result in marginal loss of resources.		
3	Significant loss of resources	The impact will result in significant loss of resources.		
4	Complete loss of resources	The impact is result in a complete loss of all resources.		
CUMUL	CUMULATIVE EFFECT			
This des	This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself			
may no	may not be significant but may become significant if added to other existing or potential impacts			
emanating from other similar or diverse activities as a result of the project activity in question.				
1	Negligible cumulative impact	The impact would result in negligible to no cumulative		
		effects.		
2	Low cumulative impact	The impact would result in insignificant cumulative		
		effects.		

The impact would result in minor cumulative effects.

The impact would result in significant cumulative effects

Table 1 Continues

Medium cumulative impact

High cumulative impact

SIGNIFICANCE

3

4

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact significance rating	Description
<mark>6 to 28</mark>	Negative low impact	The anticipated impact will have negligible negative
		effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative
		effects and will require moderate mitigation measures.

29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive

8 FINDINGS AND RECOMMENDATIONS

The geology of the proposed development footprint is underlain by the Groblershoop Formation of the Brulpan Group (Namaqua – Natal Province) as well as the Kalahari Group. According to the SAHRIS PalaeoMap the Groblershoop formation, Brulpan Group (Namaqua–Natal Province) has a zero Palaeontological sensitivity and the Kalahari Group has a Low Palaeontological significance. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. It is thus considered that the development of the proposed Development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area.

In the event that fossil remains are discovered during any phase of construction, either on the surface or unearthed by fresh excavations, the ECO in charge of these developments ought to be alerted immediately. These discoveries ought to be protected (preferably *in situ*) and the ECO must report to SAHRA so that appropriate mitigation (*e.g.* recording, collection) can be carry out by a professional paleontologist.

Preceding any collection of fossil material, the specialist would need to apply for collection permit from SAHRA. Fossil material must be curated in an approved collection (museum or university) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

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10 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty three years. She has extensive experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa for 10 years. She has been conducting Palaeontological Impact Assessments since 2014

Declaration of Independence

I, Elize Butler, declare that -

General declaration:

- I act as the independent palaeontological specialist 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 a palaeontological specialist 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;

PALAEONTOLOGICAL CONSULTANT: CONTACT PERSON:

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SIGNATURE: