

**PALAEONTOLOGICAL DESKTOP ASSESSMENT OF THE PROPOSED DIAMONDS ALLUVIAL
AND DIAMONDS GENERAL PROSPECTING RIGHT APPLICATION NEAR SCHWEIZER-RENEKE
ON THE REMAINING EXTENT OF PORTION 23 OF THE FARM MIMOSA 61 REGISTRATION
DIVISION: HO, NORTH WEST PROVINCE**

Compiled for:

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BANZAI ENVIRONMENTAL (PTY) LTD

EXECUTIVE SUMMARY

Milnex 189 CC has been appointed by **PGL Boerdery (Pty) Ltd** as the independent environmental consultant to commence with the Scoping and EIA process for a prospecting right for the prospecting of diamonds alluvial and diamonds general on the Remaining Extent of Portion 23 of the farm Mimosa 61, Registration Division: H0, near Schweizer-Reneke, North West Province. 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 construction and operation of the proposed project on the palaeontological resources.

The proposed development is primarily underlain by the Allanridge and Bothaville Formations of the Ventersdorp Supergroup as well as the Gordonia Formation of the Kalahari Group. The Ventersdorp Supergroup is characterised by the presence of igneous extrusion that is linked with the fracturing of the Kaapvaal Craton approximately 2.7 Ga (billion years) ago. The ancient basement rocks, including the **Allanridge and Bothaville Formations, are not known to be fossiliferous** and thus there is no possibility that the rocks of these formations will contain any fossils. Fossils in the Kalahari Group are usually rare and low in diversity and occur over a wide geographic area. A low palaeontological sensitivity has thus been allocated to the Kalahari Group. In the past palaeontologists did not focus on Caenozoic superficial deposits although they sometimes contain important fossil biotas. But, regardless of the rare and intermittent occurrence of fossils in this biozone a single fossil can have a huge scientific importance as many fossil taxa are known from a single fossil.

It is therefore recommended **that no further palaeontological heritage studies**, ground truthing and/or specialist mitigation are required **pending the discovery** of newly discovered fossils.

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 carried 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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2 INTRODUCTION

Milnex 189 CC has appointed Banzai Environmental (Pty) Ltd to undertake a Palaeontological Impact Assessment assessing the palaeontological impact of the proposed Diamonds Alluvial & Diamonds general mine on the Remaining Extent of Portion 23 of the farm Mimosa 61, Registration Division: H0, near Schweizer-Reneke, North West Province. (Fig. 1&2). Numerous operational alluvial diamond mines exist adjacent to the proposed development area and thus the developer is applying for the prospecting right.

Mining in South Africa has played an important role in the history of the South African economy. In 2015 the mining industry contributed R286 billion towards South African Gross Domestic Product (GDP) representing 7.1% of overall GDP. Mining also plays an important role in employment with 457 698 individuals directly employed by the sector in 2015. This represents approximately 3% of all employed nationally. Diamond mining has 17 885 direct employees. (Chamber of Mines, South Africa, 6:2016)

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 m² 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.

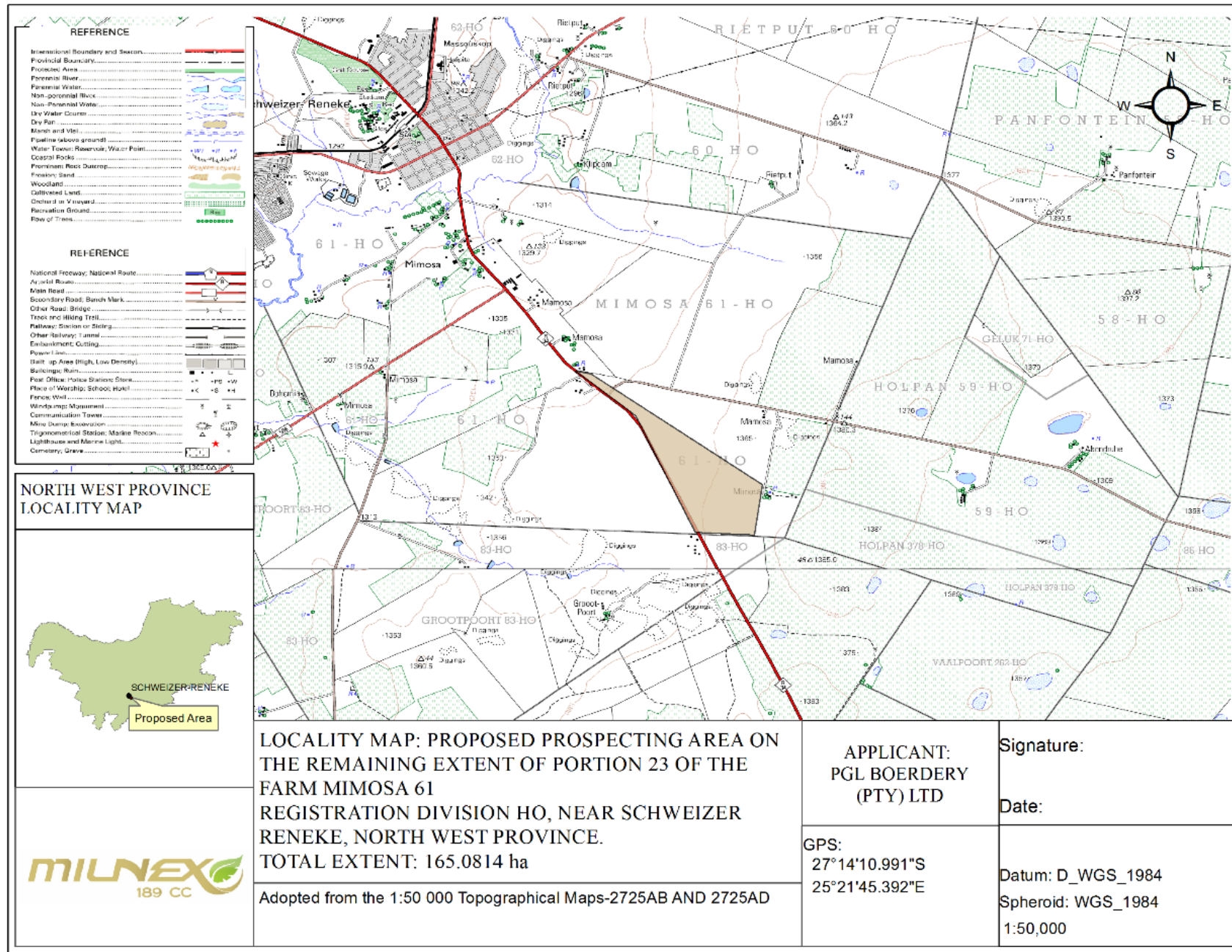


Figure 1. Locality map of the proposed prospecting area on the Remaining Extent of Portion 23 of the farm Mimosa 61, near Schweizer Reneke, North West Province. (Map provided by Milnex 189 CC).



Figure 2: Satellite image of the proposed mining development (indicated in red) on the Remaining Extent of Portion 23 of the farm Mimosa 61, near Schweizer-Reneke, North West Province. Scale bar represents 5.23 km.

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 (i.e. groups, formations, etc.) present within the study area are established from 1:250 000 geological maps. The topography of the development area is identified using 1:50 000 topography maps as well as Google Earth Images of the development area. Fossil heritage within each rock section is obtained from previous palaeontological impact studies in the same region, the PalaeoMap from SAHRIS; and databases of various institutions (identifying fossils found in locations specifically in areas close to the development area). The palaeontological importance of each rock unit of the development area is then calculated. The possible impact of the proposed development footprint on local fossil heritage is established on the following criteria: 1) the palaeontological importance of the rocks and 2) the type and scale of the development footprint and 3) quantity of bedrock excavated.

In the event that rocks of moderate to high palaeontological sensitivity are present within the study area, a field-based assessment by a professional palaeontologist is required. Based on both the desktop data and field examination of the rock exposures, the impact significance of the planned development is measured with recommendations for any further studies or mitigation. In general, 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 PALAEOLOGICAL HERITAGE

Two Geological images of the proposed development footprint are provided in this report namely the QGIS Desktop 2.18.14 map (Fig. 3) as well as an extract from the 1:250 000 2724 Christiana geological map, Council for Geoscience, Pretoria, (Fig. 4). On the QGIS map the proposed development footprint is completely underlain by the Allanridge and Bothaville Formations of the Ventersdorp Supergroup while the extract of the 1:250 000 2724 Christiana geological map shows that the development area is also underlain by the Gordonia Formation of the Kalahari Group.

4.1 PALAEOLOGY

Gordia Formation of the Kalahari Group

Caenozoic superficial deposits

Caenozoic fossil assemblages are generally rare and low in diversity and occur over a wide 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 contain important fossil biotas.

Fossil assemblages may comprise of mammalian teeth bones and horn cores, tortoise skeletons, fragments of ostrich eggs as well as microfossils, non-marine mollusc shells and freshwater stromatolites. Plant material such as foliage, wood, pollens and peats are also recovered as well as trace fossils like vertebrate tracks and burrows and termitaria (termite mounds) and rhizoliths (root casts).

Ventersdorp Supergroup

The ancient basement rocks, including the **Allanridge and Bothaville Formations, are not known to be fossiliferous.**

4.2 GEOLOGY

Caenozoic superficial deposits

The Tertiary to Caenozoic superficial deposits 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 of a steep slope), spring tufa/tuff (a porous rock composed of calcium carbonate and formed by precipitation from water, for example, around mineral springs.) and lake deposits, peats, pedocretes or duricrusts (calcrete, ferricrete), soils and gravels.

Ventersdorp Supergroup

Between 3000 and 2100 million years ago four basins developed on the Kaapvaal Craton. The Ventersdorp Supergroup developed in the second last of these basins. The Ventersdorp Supergroup comprises of the largest volcanic rock sequence on the Kaapvaal Craton. The best exposures of the Ventersdorp Supergroup is in the North West Province, Northern Cape Province as well as Gauteng and southern Botswana. This Supergroup consists of the Kliprivierberg Group (oldest) which is overlain by the Platberg Group, followed by the sedimentary Bothaville Formation and the volcanic Allanridge Formation (uppermost Vensterdorp unit, youngest Formation).

Allanridge Formation

The Allanridge formations consists primary of light green–grey porphyritic lava and pyroclastic rocks as well as dark-green amygdaloidal lava. The dark-green lava is the thickest unit in the Allanridge Formation. Both lava types consist of amygdales but is more widespread in the dark-green lava.

Bothaville Formation

The Bothaville formation consists of conglomerate and quartzites. The conglomerates is found at the base of the formation and consists of rounded boulders and pebbles of chert, banded iron formation granite, quarts, quartzite, tuff lava and quarts porphyry of Ventersdorp and older formations.

5 GEOGRAPHICAL LOCATION OF THE SITE

The proposed development footprint is located on the the Remaining Extent of Portion 23 of the farm Mimosa 61, Registration Division: H0, North West Province. The development footprint is located approximately 4.45 km South East of Schweizer-Reneke town and is approximately 165.0814 hectares in extent.

Farm Co-ordinates

25°20'47.74"E	27°13'23.31"S
25°20'50.62"E	27°13'25.36"S
25°21'17.13"E	27°13'45.11"S
25°21'46.15"E	27°14'41.95"S
25°22'14.85"E	27°14'43.10"S
25°22'18.80"E	27°14'18.73"S
25°20'55.33"E	27°13'24.82"S

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 the author's experience, topographical and geological maps, aerial photos (using Google Earth, 2017/2018), and other reports from the same area were used to assess the proposed development footprint.

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.

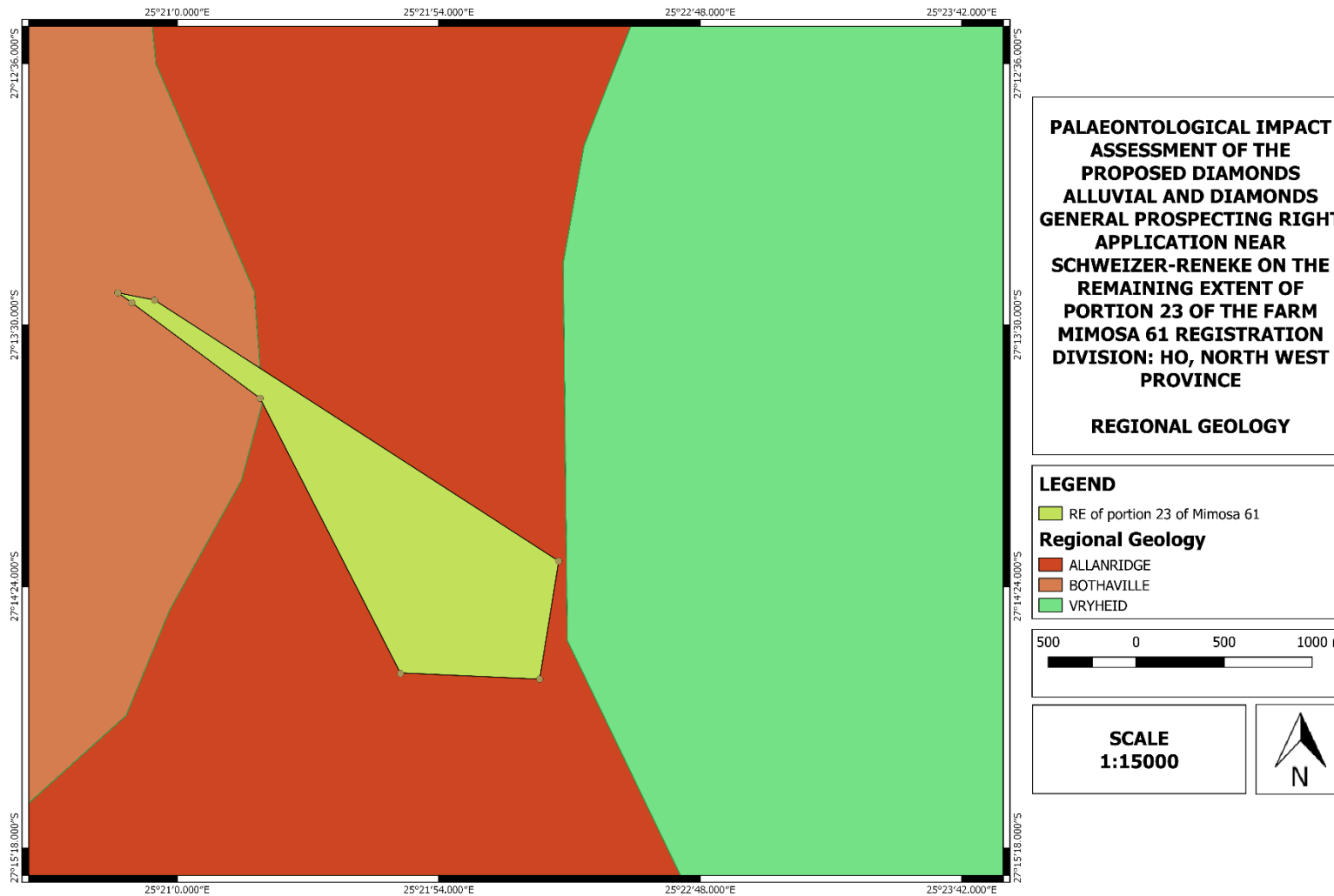


Figure 3. The surface geology of the proposed Diamonds alluvial and Diamonds General prospecting right application near Schweizer-Reneke on the remaining extent if portion 23 of the farm Mimosa 61, North West Province is primary underlain by rocks of the Allanridge and Bothaville Formations of the Ventersdorp Supergroup. Map drawn QGIS Desktop 2.18.14.

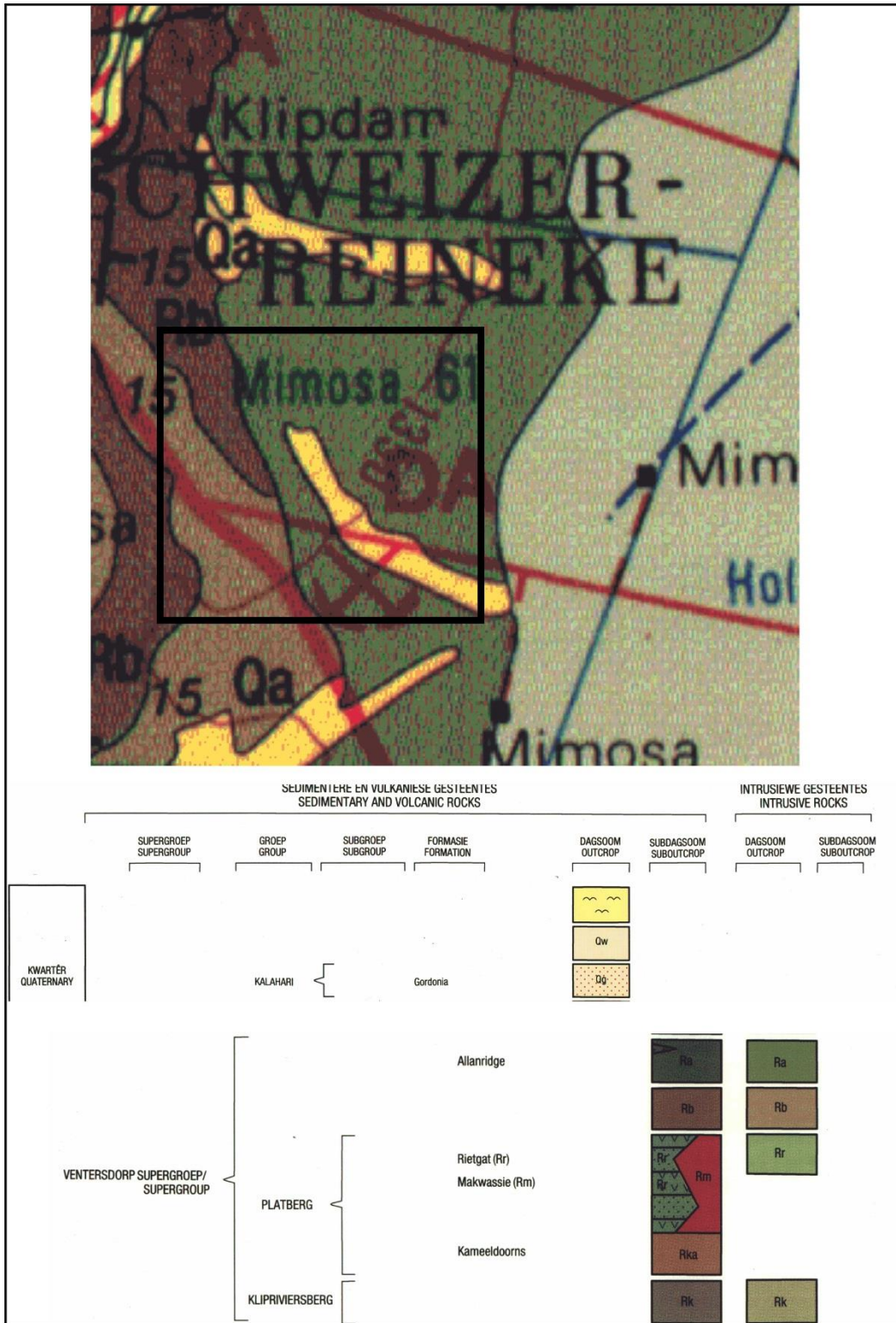


Figure 4. Extract of the 1:250 000 2724 Christiana geological map shows the general surface geology of the proposed Diamonds alluvial and Diamonds General prospecting right application near Schweizer-Reneke (outlined in black) on the remaining extent of portion 23 of the farm Mimosas 61, North West Province. The development footprint is primarily underlain by rocks of the Allanridge and Bothaville Formations of the Ventersdorp Supergroup and by the Gordonia Formation of the Kalahari Group. Map provided by the Council for Geoscience, Pretoria.

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*

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the 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	Unlikely	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 proposed 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 costs of rehabilitation and remediation.

Table 1 Continues

REVERSIBILITY

This describes the degree to which an impact can be successfully reversed upon completion of the proposed 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.

CUMULATIVE EFFECT

This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself 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.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects

Table 1 Continues

SIGNIFICANCE		
<p>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:</p> <p>(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.</p> <p>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.</p>		
Points	Impact significance rating	Description
6 to 28	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 proposed development is primarily underlain by the Allanridge and Bothaville Formations of the Ventersdorp Supergroup as well as the Gordonia Formation of the Kalahari Group. The Ventersdorp Supergroup is characterised by the presence of igneous extrusion that is linked with the fracturing of the Kaapvaal Craton approximately 2.7 Ga (billion years) ago. The ancient basement rocks, including the **Allanridge and Bothaville Formations, are not known to be fossiliferous** and thus there is no possibility that the rocks of these formations will contain any fossils. Fossils in the Kalahari Group are usually rare and low in diversity and occur over a wide geographic area. A low palaeontological sensitivity has thus been allocated to the Kalahari Group. In the past palaeontologists did not focus on Caenozoic superficial deposits although they sometimes contain important fossil biotas. But, regardless of the rare and intermittent occurrence of fossils in this biozone a single fossil can have a huge scientific importance as many fossil taxa are known from a single fossil.

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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 carried 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.

9 REFERENCES

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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:

Banzai Environmental (Pty) Ltd

CONTACT PERSON:

Elize Butler

Tel: +27 844478759

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SIGNATURE:

A handwritten signature in black ink, appearing to read 'Elize Butler', with a period at the end.