BANZAI ENVIRONMENTAL

PALAEONTOLOGICAL DESKTOP ASSESSMENT

PROSPECTING RIGHT APPLICATION FOR DIAMONDS NEAR WOLMARANSSTAD ON FARM KATBOSCHFONTEIN 164, NORTH WEST PROVINCE

2023

NW30/5/1/1/2/13724PR

COMPILED FOR: MILNEX CC

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 favorable 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 favorable 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 realize that a false declaration is an offense 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

Email: info@banzai-group.com

SIGNATURE:

The Palaeontological Desktop Assessment report has been compiled considering the National Environmental Management Act 1998 (NEMA) and Environmental Impact Regulations 2014 as amended, requirements for specialist reports, Appendix 6, as indicated in the table below.

Table 1: Checklist for Specialist studies in compliance with Appendix 6 of the EIA Regulations of 2014 (as amended)

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**The relevant section in the report**	**Comment where not applicable.**
1.(1) (a) (i) Details of the specialist who prepared the report	Page ii and Section 2 of Report – Contact details and company and Appendix A	-
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 2 – refer to **Appendix A**	-
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report	-
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 4 – Objective	-
(cA) An indication of the quality and age of base data used for the specialist report	Section 5 – Geological and Palaeontological history	-
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 8	-

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**The relevant section in the report**	**Comment where not applicable.**
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 1 & 9	
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 8 Approach and Methodology	-
(f) details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 1 & 9	
(g) An identification of any areas to be avoided, including buffers	Section 1 & 9	
(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;	Section 5 – Geological and Palaeontological history	
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7.1 – Assumptions and Limitation	-
(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 1 and 9	
(k) Any mitigation measures for inclusion in the EMPr	Section 1 and 9	

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**The relevant section in the report**	**Comment where not applicable.**
(l) Any conditions for inclusion in the environmental authorisation	Section 1 and 9	
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 1 and 9	
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 1 and 9	
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and		
(n)(ii) If the opinion is that the proposed activity, activities 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	Section 1 and 9	-
(o) A description of any consultation process that was undertaken during the course of carrying out the study	N/A	Not applicable. A public consultation process was handled as part of the Environmental Impact Assessment (EIA) and Environmental Management

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	The relevant section in the report	Comment where not applicable.
		Plan (EMP) process.
(p) A summary and copies of any comments that were received during any consultation process	N/A	Not applicable. To date, no comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.	N/A	Not applicable.
(2) Where a government notice 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.	Section 3 compliance with SAHRA guidelines	

EXECUTIVE SUMMARY

Banzai Environmental was appointed by Milnex CC to conduct the Palaeontological Desktop Assessment (PDA) to assess the proposed Prospecting Right application to prospect for Diamonds Alluvial (DA), Diamonds General (D) and Diamonds (DIA) near Wolmaransstad on Portion 8, 16, 19, 21, 22 and 27 of the farm Katboschfontein 164, Registration Division: HO, North West province. In accordance with the National Environmental Management Act 107 of 1998 (NEMA) and to comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), this PDA is necessary to confirm if fossil material could potentially be present in the planned development and to evaluate the potential impact of the proposed development on the Palaeontological Heritage of the area.

The proposed Katboschfontein Prospecting Right development is entirely underlain by the undifferentiated Ecca. In this area, the undifferentiated Ecco comprise of the Volksrust and Vryheid Formations (Ecca Group, Karoo Supergroup), Updated geology compiled by the Council of Geosciences, Pretoria) also indicates that the proposed study area is underlain by the Ecca Group. The PalaeoMap of the South African Heritage Resources Information System (SAHRIS) indicates that the Palaeontological Sensitivity of the undifferentiated Ecca is High (Almond et al, 2013; SAHRIS website) and this corresponds with the Department of Forestry, Fisheries and the Environment (DFFE) Web based Environmental Screening Tool. Fossils in this region are rare and it is thus considered that the proposed development will not lead to damaging impacts on the palaeontological resources of the area. From a Palaeontological perspective the proposed mining development may thus be permitted in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources.

However, if fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the ECO/site manager in charge of these developments must be informed immediately. These discoveries ought to be protected (if possible, *in situ*) and the ECO/site manager must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carry out by a paleontologist.

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

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1 INTRODUCTION

Milnex CC was contracted NVW Boerdery (Pty) Ltd as the independent environmental consultant to undertake the Scoping and EIA process for a proposed Prospecting Right application to prospect for Diamonds Alluvial (DA), Diamonds General (D) and Diamonds (DIA) near Wolmaransstad on Portion 8, 16, 19, 21, 22 and 27 of the farm Katboschfontein 164, Registration Division: HO, North West province. The property is located approximately 40km East of Schweizer-Reneke on route to Wolmaransstad in the North West Province[1] (Figure 1-2).

Banzai Environmental was in turn appointed to conduct the Palaeontological Desktop Assessment for the Project.

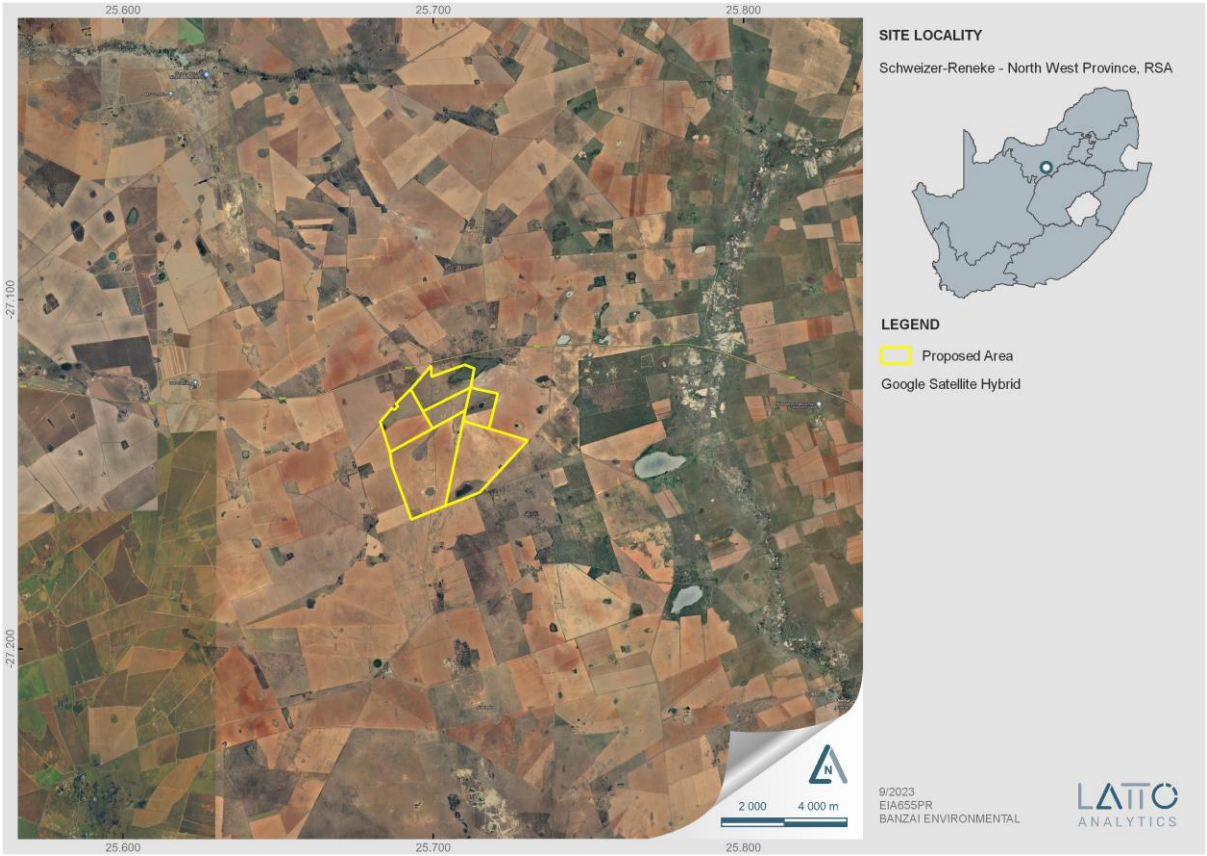


Figure 1:*Regional locality of the proposed diamond Prospecting Right Application near Wolmaransstad in the North West Province.*

[1]Information provided by Milnex cc

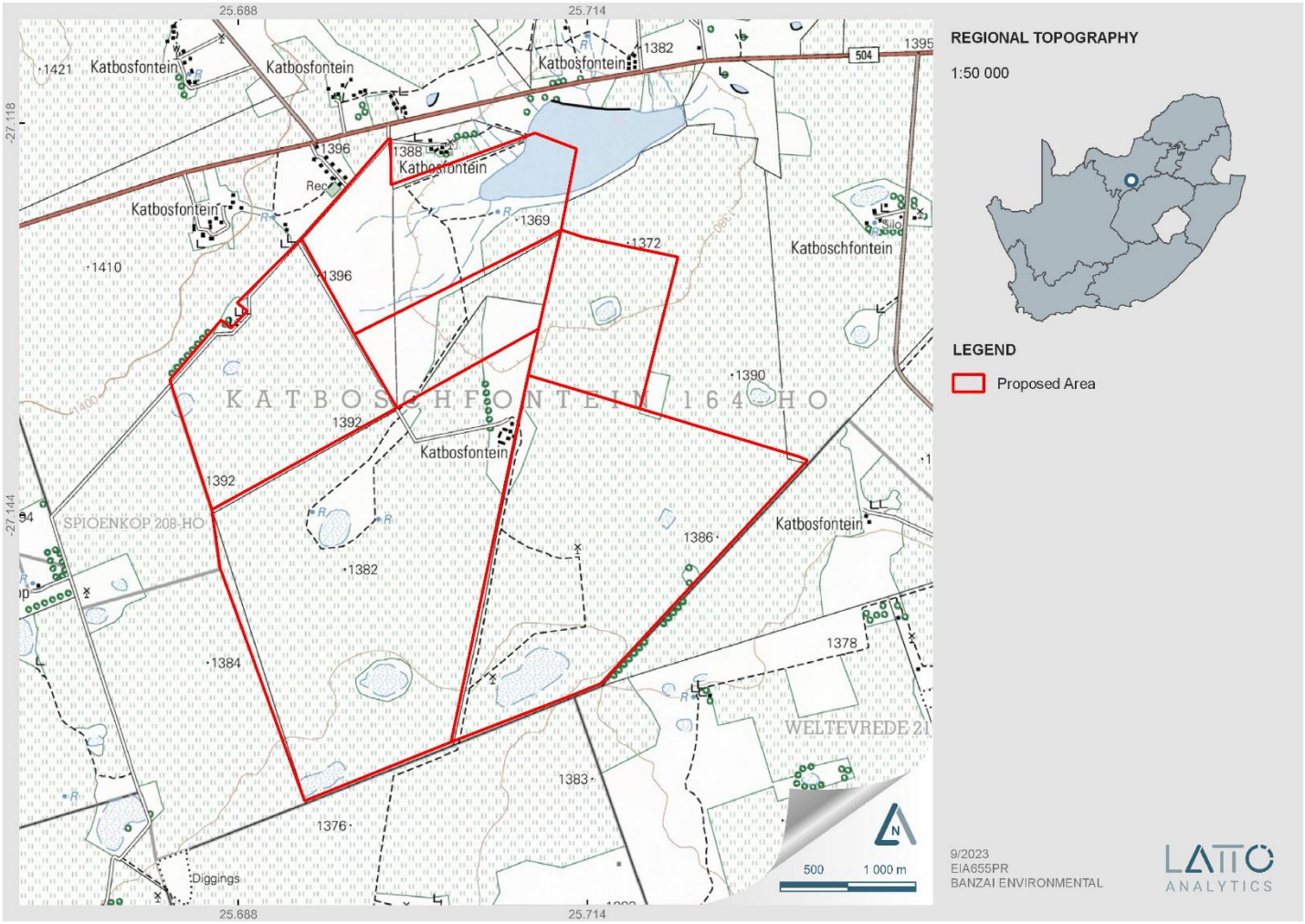


***Figure 2**:Locality of the proposed diamond Prospecting Right Application near Wolmaransstad in the North West Province.*

2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

This study has been conducted by Mrs Elize Butler. She has conducted approximately 300 palaeontological impact assessments for developments in the Free State, KwaZulu-Natal, Eastern, Central, and Northern Cape, Northwest, Gauteng, Limpopo, and Mpumalanga. She has an MSc (*cum laude*) in Zoology (specializing in Palaeontology) from the University of the Free State, South Africa and has been working in Palaeontology for more than twenty-eight years. She has 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 (PSSA) since 2006 and has been conducting PIAs since 2014.

3 LEGISLATION

National Heritage Resources 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".

The identification, evaluation and assessment of any cultural heritage site, artefact or finds in the South African context is required and governed by the following legislation:

- National Environmental Management Act (NEMA) Act 107 of 1998
- National Heritage Resources Act (NHRA) Act 25 of 1999
- Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
- Notice 648 of the Government Gazette 45421- general requirements for undertaking an initial site sensitivity verification where no specific assessment protocol has been identified.

The next section in each Act is directly applicable to the identification, assessment, and evaluation of cultural heritage resources.

GNR 982 (Government Gazette 38282, 14 December 2014) promulgated under the National Environmental Management Act (NEMA) Act 107 of 1998

- Basic Assessment Report (BAR) – Regulations 19 and 23
- Environmental Impacts Assessment (EIA) – Regulation 23
- Environmental Scoping Report (ESR) – Regulation 21
- Environmental Management Programme (EMPr) – Regulations 19 and 23

National Heritage Resources Act (NHRA) Act 25 of 1999

- Protection of Heritage Resources – Sections 34 to 36

- Heritage Resources Management – Section 38

MPRDA Regulations of 2014

Environmental reports to be compiled for application of mining right – Regulation 48

- Contents of scoping report – Regulation 49
- Contents of environmental impact assessment report – Regulation 50
- Environmental management programme – Regulation 51
- Environmental management plan – Regulation 52

The NEMA (No 107 of 1998) states that an integrated EMP should (23:2 (b)) "*…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*".

In agreement with legislative requirements, EIA rating standards as well as SAHRA policies the following comprehensive and legally compatible PIA report have been compiled.

Palaeontological heritage is exceptional and non-renewable and is protected by the NHRA. Palaeontological resources and may not be unearthed, broken moved, 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 Impact 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 m^2 in extent.
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

4 OBJECTIVE

The objective of a Palaeontological Impact Assessment (PIA) 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 PIA are: 1) to identify the palaeontological status of the exposed as well as rock formations just below the surface in the development footprint 2) to estimate the palaeontological importance of the formations 3) to determine the impact on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate damage to fossil heritage.

The terms of reference of a PIA are as follows:

General Requirements:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended;
- Adherence to all applicable best practice recommendations, appropriate legislation and authority requirements;
- Submit a comprehensive overview of all appropriate legislation, guidelines;
- Description of the proposed project and provide information regarding the developer and consultant who commissioned the study,
- Description and location of the proposed development and provide geological and topographical maps
- Provide palaeontological and geological history of the affected area.
- Identification of sensitive areas to be avoided (providing shapefiles/kmls) in the proposed development;
- Evaluation of the significance of the planned development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
    a. Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity.
    b. Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity.
    c. Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities.

- Fair assessment of alternatives (infrastructure alternatives have been provided):
- Recommend mitigation measures to minimise the impact of the proposed development; and
- Implications of specialist findings for the proposed development (such as permits, licenses etc).

5 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The proposed Katboschfontein Prospecting Right Application is depicted on the 1: 250 000 Christiana 2724 Geological Map (Council for Geosciences, Pretoria) (Figure 3, Table 2). This map indicates that the proposed Prospecting Right Application is underlain by the undifferentiated Ecca Group (Karoo Supergroup), that is represented by the Volksrust and Vryheid Formations in this area. The Palaeontological Sensitivity generated by the National Environmental Web-Based Screening (depicted in Figure 4) indicates that the Palaeontological Sensitivity of the proposed development is High (red) and corresponds with the SAHRIS PalaeoMap (Figure 5, Table 3).

The Volksrust Formation consists of basinal grey to black, silty shale with thin, usually bioturbated, siltstone or sandstone lenses and beds, particularly towards its upper and lower boundaries. Thin phosphate and carbonate beds and concretions are relatively common. These deposits may also be lacustrine or even lagoonal (Cairncross et al 1998). Fossils from the Volksrust Formation include rare temnospondyl amphibian remains, invertebrates, petrified wood, and low-diversity marine to non-marine trace fossil assemblages. Minor coals with plant remains have also been found in this Formation. The bivalve *Megadesmus* has been documented from the Volksrust Formation (Bamford 2011).

The Permian Vryheid Formation is internationally renowned for its coal deposits and is known for its rich assemblage of Glossopteris flora which is the source vegetation for this formation. The depth of the Vryheid Formation in the main Karoo Basin may be up to 500 m near Vryheid and New Castle in Kwazulu-Natal (type-locality), where the basin was at its deepest. The Vryheid Formation thins from the north-eastern part of the basin and finally wedges out towards the west, southwest and south (Johnson 2009). This formation forms a part of the Middle Ecca (Kent 1980) and contains the largest coal reserves in South Africa.

The Vryheid Formation comprises mudrock, rhythmite, siltstone and fine- to coarse-grained sandstone (pebbly in places). The Formation contains up to five (mineable) coal seams. The different lithofacies are mainly arranged in upward-coarsening deltaic cycles (up to 80m thick in the southeast). Fining-upward fluvial cycles, of which up to six are present in the east, are typically sheet-like in geometry, although some form valley-fill deposits. They comprise coarse-grained to pebbly, immature sandstones - with an abrupt upward transition into fine-grained sediments and coal seams (Hancox and Götz, 2014). This formation is known to contain a rich assemblage of Glossopteris flora which is the source vegetation for the Vryheid Formation. Gymnospermous glossopterids

dominated the peat and non-peat accumulating of Permian wetlands after continental deglaciation took place (Falcon, 1986c, Greb et al., 2006).

Recent palaeobotanical studies in the Vryheid Formation include that of Adenforff (2005), Bordy and Prefect (2008) and Prefect *et al.* (2008, 2009, 2010) and Prevec, (2011). Bamford (2011) described numerous plant fossils from this formation (e.g., *Azaniodendron fertile*, *Cyclodendron leslii, Sphenophyllum hammanskraalensis, Annularia sp., Raniganjia sp., Asterotheca spp., Liknopetalon enigmata, Hirsutum* sp., *Scutum* sp., *Ottokaria* sp., *Estcourtia* sp., *Arberia* sp., *Lidgetonnia* sp., *Noeggerathiopsis* sp., *Podocarpidites* sp as well as more than 20 Glossopteris species.

Palynological studies focussing on the coal bearing successions of the Vryheid Formation and include articles by Aitken (1993, 1994, 1998), and Millsteed (1994, 1999), while recent studies were conducted by Götz and Ruckwied (2014). To date no fossil vertebrates have been collected from the Vryheid formation. The occurrence of fossil insects is rare, while palynomorphs are diverse. Non-marine bivalves and fish scales have also been reported from this formation. Trace fossils are abundantly found but the diversity is low. The mesosaurid reptile, *Mesosaurus* has been found in the southern parts of the basin but may also be present in other areas of the Vryheid formation. Regardless of the rare occurrence of fossils in this biozone a single fossil may be scientifically important as several fossil taxa are known from a single fossil.

The National Palaeontological Databases show no fossil findings in the development area.

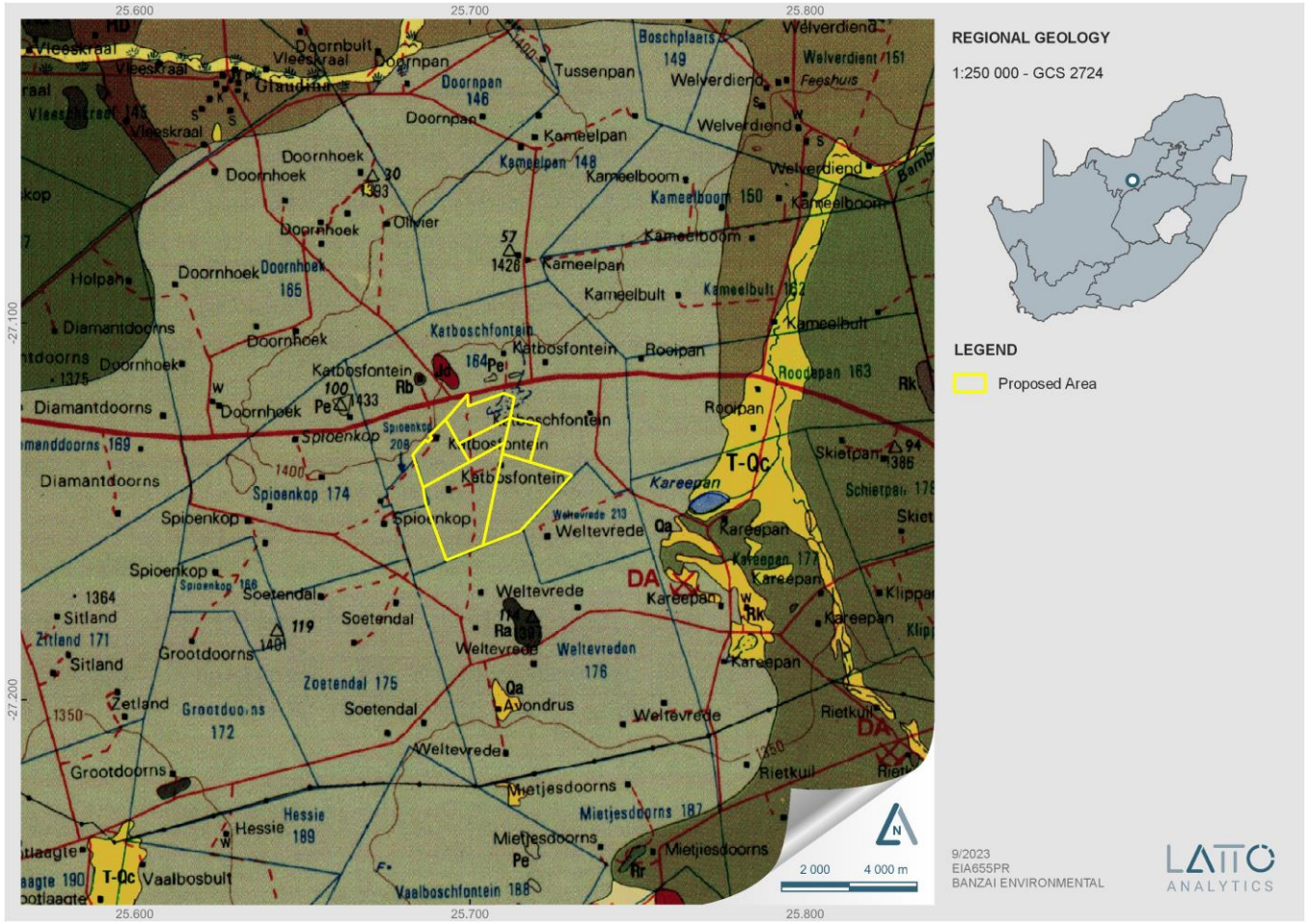
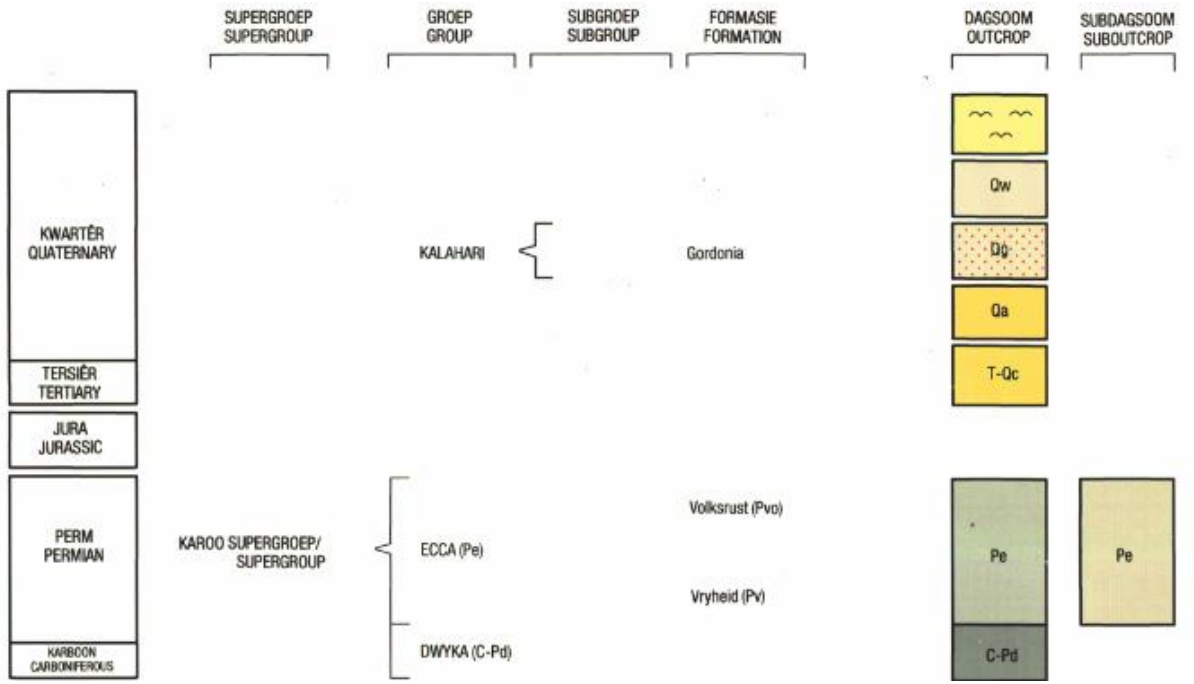


Figure 3: *Extract of the 1: 250 000 Christiana 2724 Geological Map (Council for Geosciences, Pretoria) indicates that the proposed prospecting application is underlain by the undifferentiated Ecca (Pe, green khaki) comprising of the Volksrust Formation, and Vryheid Formations of the Ecca Group*

Table 2:Legend of Christiana2724 Geological Map (Council for Geosciences, Pretoria)



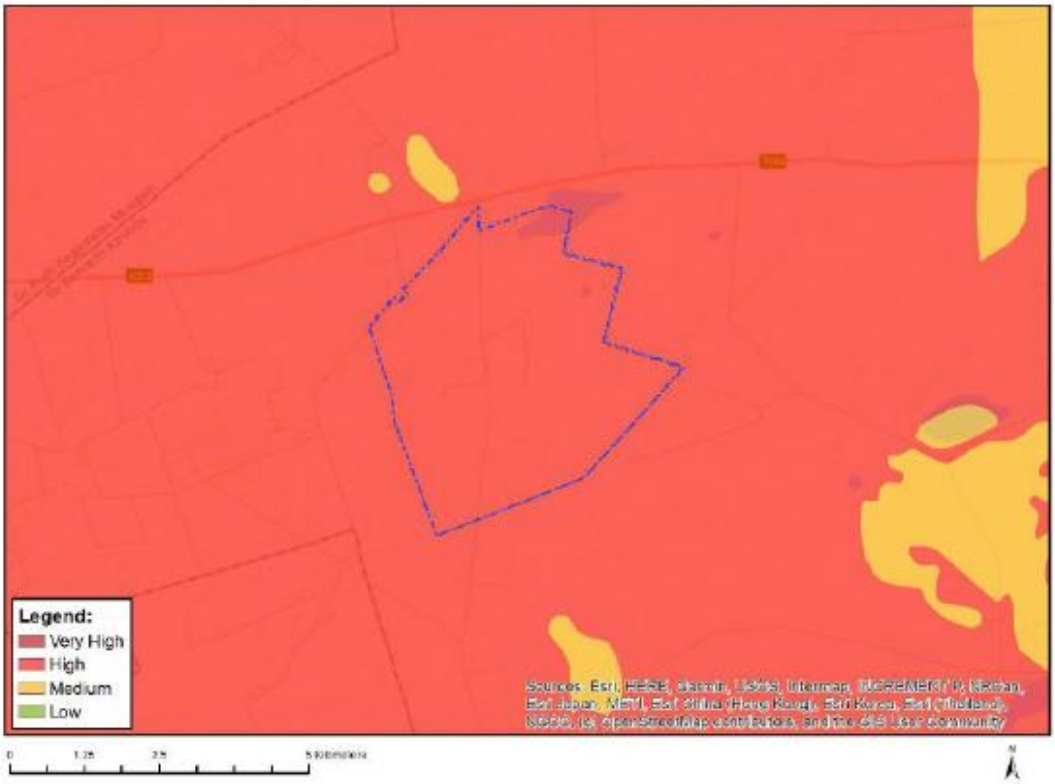


Figure 4: Palaeontological Sensitivity generated by the National Environmental Web-Based Screening *indicates that the Palaeontological Sensitivity of the proposed development is High (red).*

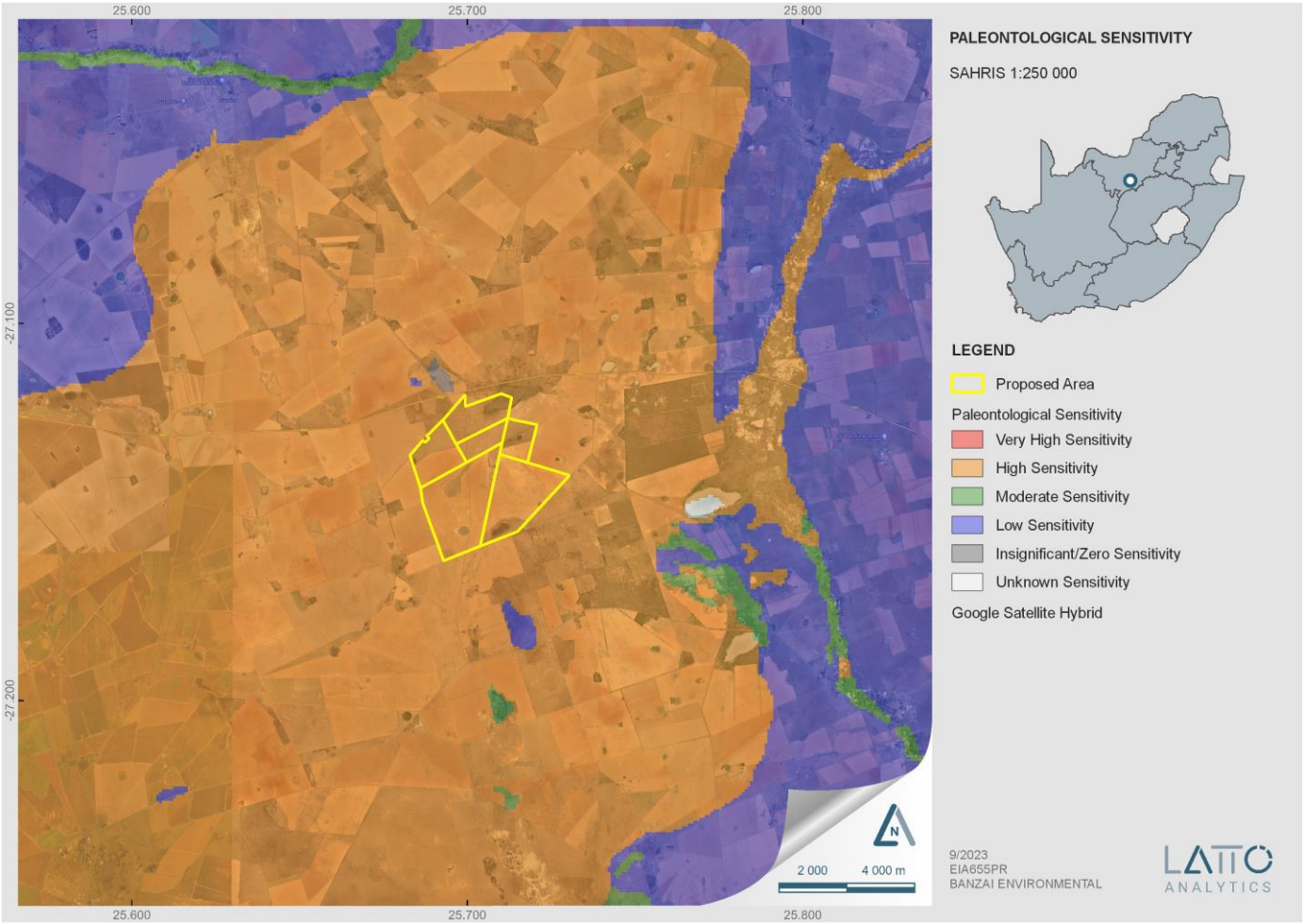


***Figure 5**: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicates that the study area has a High Palaeontological Sensitivity.*

Table 3: Palaeontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website

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.

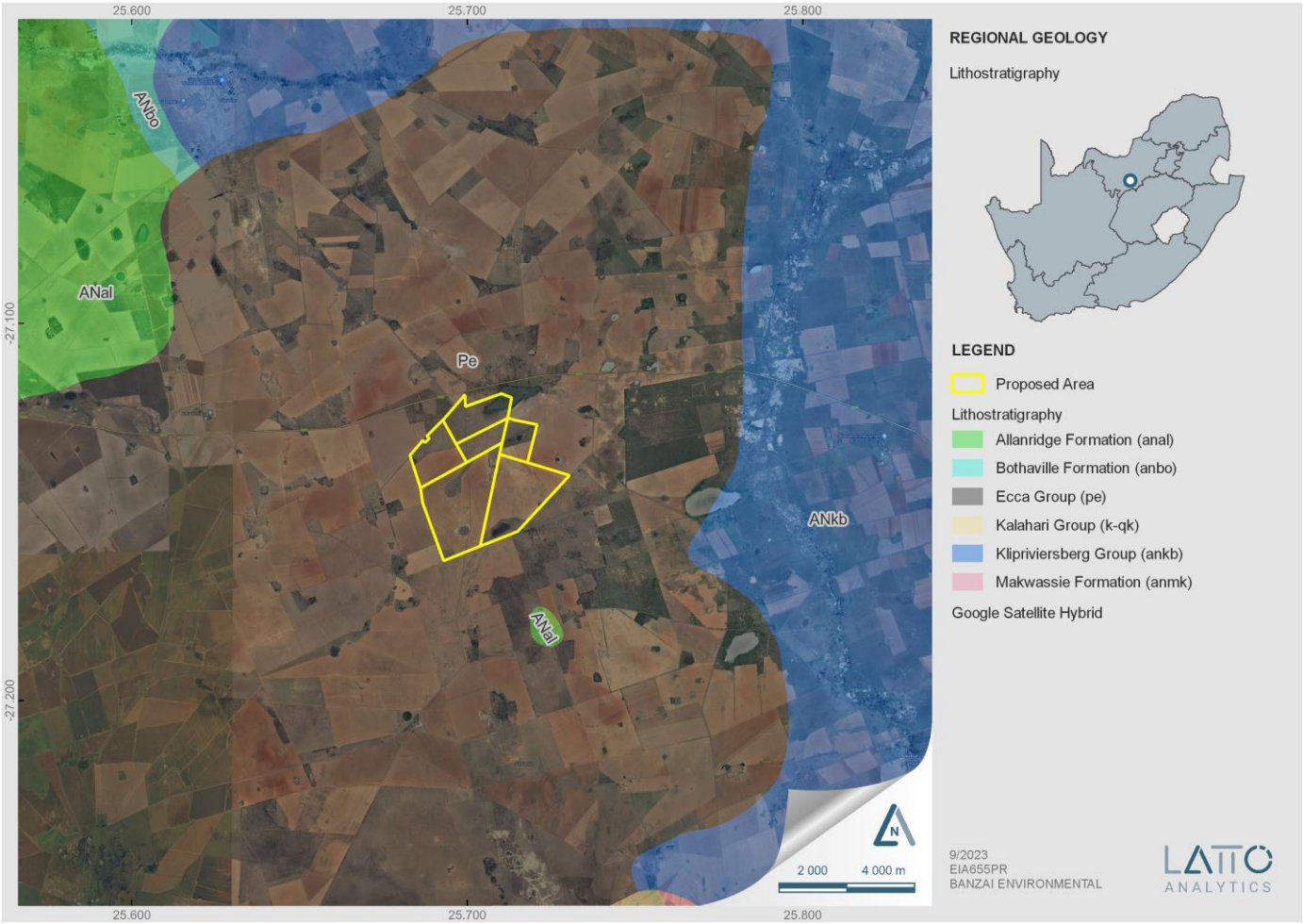


Figure 6: *Updated Geology (Council of Geosciences, Pretoria) of the proposed Application is underlain by the Ecca Group.*

6 GEOGRAPHICAL LOCATION OF THE SITE

Table 4: Property description

Farm Name:	Portion 8 of the farm Katboschfontein 164 Extent: 352.1303 hectares Title Deed: T13861/2009 2) Portion 16 of the farm Katboschfontein 164 Extent: 454.6757 hectares Title Deed: T109467/2002 3) Portion 19 of the farm Katboschfontein 164 Extent: 171.3064 hectares Title Deed: T109470/2002 4) Portion 21 of the farm Katboschfontein 164 Extent: 98.5012 hectares Title Deed: T14834/2002 5) Portion 22 of the farm Katboschfontein 164 Extent: 85.6532 hectares Title Deed: T109467/2002 6) Portion 27 of the farm Katboschfontein 164 Extent: 171.3064 Title Deed: T148340/2002
Application area (Ha)	1333.5732 hectares
Magisterial district:	Dr Kenneth Kaunda District Municipality Maquassi - Hills Local Municipality
Registration Division	HO
Distance and direction from nearest town	The property is located approximately 40km East of Schweizer-Reneke on route to Wolmaransstad in the North West Province.
21 digit Surveyor General Code for each farm portion	1) T0HO00000000016400008 2) T0HO00000000016400016 3) T0HO00000000016400019 4) T0HO00000000016400021 5) T0HO00000000016400022 6) T0HO00000000016400027
Minerals Applied for	Diamonds Alluvial (DA) Diamonds General (D) Diamonds (DIA)

Table 5: GPS Coordinates

FARM	LONGITUDE	LATITUDE
Portion 8 of the farm Katboschfontein 164	27° 8' 25,335"" S	25° 43' 49,472"" E
	27° 9' 18,636"" S	25° 42' 54,043"" E
	27° 9' 21,391"" S	25° 42' 46,458"" E

2) Portion 16 of the farm Katboschfontein 164 3) Portion 19 of the farm Katboschfontein 164 4) Portion 21 of the farm Katboschfontein 164 5) Portion 22 of the farm Katboschfontein 164 6) Portion 27 of the farm Katboschfontein 164	27° 9' 32,631"" S	25° 42' 13,837"" E
	27° 9' 18,636"" S	25° 42' 54,043"" E
	27° 9' 21,391"" S	25° 42' 46,458"" E
	27° 9' 32,631"" S	25° 42' 13,837"" E
	27° 9' 46,677"" S	25° 41' 34,563"" E
	27° 8' 50,994"" S	25° 41' 11,841"" E
	27° 8' 37,118"" S	25° 41' 9,685"" E
	27° 8' 6,127"" S	25° 40' 58,384"" E
	27° 7' 51,824"" S	25° 41' 12,159"" E
	27° 7' 53,789"" S	25° 41' 14,761"" E
	27° 7' 49,660"" S	25° 41' 19,177"" E
	25° 41' 16,446"" E	27° 7' 47,696"" S
	25° 41' 33,756"" E	27° 7' 32,417"" S
	25° 41' 46,748"" E	27° 7' 19,144"" S
	25° 41' 56,996"" E	27° 7' 8,643"" S
	25° 41' 57,727"" E	27° 7' 19,507"" S
	25° 42' 36,359"" E	27° 7' 7,155"" S
	25° 42' 47,506"" E	27° 7' 10,936"" S
	25° 42' 43,351"" E	27° 7' 30,316"" S
	25° 42' 49,765"" E	27° 7' 32,153"" S
	25° 43' 14,708"" E	27° 7' 36,773"" S
	25° 43' 4,486"" E	27° 8' 12,991"" S

7 ADDITIONAL INFORMATION CONSULTED

In compiling this report the following sources were consulted:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984)
- A Google Earth map with polygons of the proposed development was obtained from Milnex cc.
- 1:250 000 Christiana2724 Geological Map (Council for Geosciences, Pretoria).

8 IMPACT ASSESSMENT METHODOLOGY

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; and
- 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 6: The rating system

NATURE		
The Nature of the Impact is the possible destruction of fossil heritage		
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).
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.
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

SIGNIFICANCE

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 = X.

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
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

8.1 Summary of Impact Tables

Loss of fossil heritage will be a negative impact. Only the site will be affected by the proposed development. The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures, the damage or destruction of any palaeontological materials will be permanent. Impacts on palaeontological heritage during the construction phase could potentially occur but are regarded as having a Low probability. As fossil heritage will be destroyed the impact is irreversible. The significance of the impact occurring will be low.

Table 7: Summary of Impact Tables

IMPACTS	Site	Probability	Duration	Magnitude	Reversibility	Irreplicable Loss	Cumulative Effect	Significance
	1	2	4	2	4	4	2	17

9 FINDINGS AND RECOMMENDATIONS

The proposed Prospecting Right Application is underlain by the undifferentiated Ecca Group (Karoo Supergroup), that is represented by the Volksrust and Vryheid Formations in this area. The Palaeontological Sensitivity generated by the National Environmental Web-Based Screening indicates that the Palaeontological Sensitivity of the proposed development is high, and corresponds with the PalaeoMap of SAHRIS (Almond *et al*, 2013; SAHRIS website). However, fossils are very rare in this region and it is thus considered that the proposed development will not lead to damaging impacts on the palaeontological resources of the area. From a Palaeontological perspective the proposed mining development may thus be permitted in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources.

However, if fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the ECO/site manager in charge of these developments must be informed immediately. These discoveries ought to be protected (if possible, *in situ*) and the ECO/site manager must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carry out by a paleontologist.

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

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APPENDIX A

CURRICULUM VITAE

ELIZE BUTLER

PROFESSION:	Palaeontologist
YEARS' EXPERIENCE:	30 years in Palaeontology
EDUCATION:	B.Sc Botany and Zoology, 1988
	University of the Orange Free State
	B. Sc (Hons) Zoology, 1991
	University of the Orange Free State
	Management Course, 1991
	University of the Orange Free State
	M. Sc. *Cum laude* (Zoology), 2009 University of the Free State

Dissertation title: The postcranial skeleton of the Early Triassic non-mammalian Cynodont *Galesaurus planiceps*: implications for biology and lifestyle

MEMBERSHIP
Palaeontological Society of South Africa (PSSA) 2006-currently

EMPLOYMENT HISTORY

Part time Laboratory assistant	Department of Zoology & Entomology University of the Free State Zoology 1989-1992
Part time laboratory assistant	Department of Virology University of the Free State Zoology 1992
Research Assistant	National Museum, Bloemfontein 1993 – 1997
Principal Research Assistant and Collection Manager	National Museum, Bloemfontein 1998–2022

TECHNICAL REPORTS

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