Palaeontological Impact Assessment

PROPOSED DEVELOPMENT ON ERF 2006 PARSONSVLEI, NELSON MANDELA METRO MUNICIPALITY, GQEBERHA

Prepared for:

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EXECUTIVE SUMMARY

Engineering Advice & Services (Pty) Ltd has been entrusted to conduct an environmental impact assessment pertaining to the environmental aspects relevant to the current project area. As part of the environmental impact assessment, a palaeontological heritage assessment and site sensitivity verification are deemed essential. This process encompasses a desktop study along with a field-based assessment. The assessment is conducted in accordance with the Environmental Impact Assessment (EIA) regulations of 2014, as published in the Government Notice under section 24(5) of the National Environmental Management Act (Act No. 107 of 1998).

The development for Erf 2006 is located in Parsonsvlei, Nelson Mandela Bay, Gqeberha. The proposed development site is located in the Peninsula Formation, characterized by a limited presence of fossils. The development plan for this site entails the excavation of superficial sediments, reaching several meters below the surface, which could lead to the exposure of fresh sediment layers. These actions potentially pose a risk to the preservation of palaeontological resources in the immediate vicinity.

Palaeosensitivity mapping designates the project area as possessing a medium palaeosensitivity. Nevertheless, the current field assessment and a comprehensive review of existing research findings, suggest a low palaeontological significance for Erf 2006.

In view of this assessment, the proposed development is considered both viable and suitable for this location, with no anticipated adverse impacts on the palaeontological heritage of the region.

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1. INTRODUCTION

1.1. INTRODUCTION

Engineering Advice & Services (Pty) Ltd has been appointed to conduct an environmental impact assessment of the environmental aspects relevant to the current project area. Engineering Advice & Services (Pty) Ltd appointed Mr. Ryan Nel, an independent palaeontology specialist to conduct a Palaeontological Impact Assessment for Erf 2006 (Fig. 1), in terms of the Environmental Impact Assessment (EIA) regulations 2014, as published in the Government Notice in terms of section 24(5) of the National Environmental Management Act (Act No 107 of 1998).

To adhere to the stipulations outlines in Appendix 6 of the Environmental Impact Assessment regulations 2014, as published in the Government Notice in terms of section 24(5) of the National Environmental Management Act (Act No 107 of 1998) a comprehensive palaeontological heritage assessment and site sensitivity are required. This comprises a desktop study and a field-based assessment.

1.2. TERMS OF REFERENCE

The execution of this palaeontological report forms part of the Heritage Impact Assessment in terms of Section 38 (2a) and includes the evaluation process required to identify and assess the development site. The main objective of this assessment is to provide background information on the palaeontology and fossil heritage in and outside the vicinity of the development area ultimately provide recommendations for mitigation purposes (if applicable).

The palaeontological study will encompass the following terms of reference:

i. Provide a comprehensive summary of the relevant legislation governing palaeontological heritage.
ii. Conduct a non-intrusive site inspection by national legislation requirements.
iii. Determine the probability of encountering palaeontological remains of significance within the proposed site.
iv. Identify and illustrate the precise locations of any significant palaeontological remains.
v. Assess the sensitivity of palaeontological remains present on the site.
vi. Evaluate the significance of both direct and cumulative impacts stemming from the proposed development and any viable alternatives on palaeontological resources.
vii. Propose and outline mitigatory measures designed to safeguard and preserve any valuable palaeontological sites and remains that may be discovered within the proposed site.
viii. Prepare and submit any necessary permit applications to the relevant authorities in accordance with regulatory requirements.

1.3. LEGISLATIVE CONTEXT FOR PALAEONTOLOGICAL ASSESSMENT

All heritage resources are protected by the National Heritage Act (Act 25 of 1999). The current palaeontological report forms part of the Heritage Impact Assessment under Section 35 and Section 38 of this Act.

According to Section 35 of the National Heritage Resources Act, dealing with archaeology, palaeontology, and meteorites (In reference to palaeontological, archaeological and meteorite resources found in South Africa):

(1) the protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority.

(2) all archaeological objects, palaeontological material and meteorites are the property of the State.

(3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.

(4) No person may, without a permit issued by the responsible heritage resources authority –

> (*a*) destroy, damage, excavate, alter, deface, or otherwise disturb any archaeological or palaeontological site or any meteorite;
>
> (*b*) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
>
> (*c*) trade-in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
>
> (*d*) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment that assists in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

(5) When the responsible heritage resources authority has reasonable cause to believe that any activity or development that will destroy, damage, or alter any archaeological or palaeontological site is underway, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may –

> (*a*) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
>
> (*b*) carry out an investigation to obtain information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
>
> (*c*) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
>
> (*d*) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

(6) The responsible heritage resources authority may, after consultation with the owner of the land on which an archaeological or palaeontological site or a meteorite is situated, serve a notice on the owner or any other controlling authority, to prevent activities within a specified distance from such site or meteorite.

According to Section 38 (1), a Heritage Impact Assessment is necessary to assess any potential impacts on palaeontological heritage within the development footprint where:

(a) the construction of a road, wall, power line, pipeline, canal, or other similar form of linear development or barrier exceeding 300 m in length;
(b) the construction of a bridge or similar structure exceeding 50 m in length;
(c) any development or other activity which will change the character of a site—
  i. exceeding 5 000 m2 in extent; or
  ii. involving three or more existing erven or subdivisions thereof; or
  iii. involving three or more erven or divisions thereof which have been consolidated within the past five years; or
  iv. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority.
  v. the re-zoning of a site exceeding 10 000 m² in extent.
  vi. or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

1.4. GENERAL APPROACH OF STUDY

This current assessment follows the SAHRA APM Guidelines: Minimum Standards for the palaeontological component of Heritage Assessment Reports (SAHRA, 2013).

The compilation of the report is based on:

(i) A comprehensive literature review, conducted to gather information from published materials related to geology and palaeontology in the project area.
(ii) previous palaeontological impact assessments which are used as additional material.
(iii) published geological maps and Google Earth Satellite imagery.
(iv) a non-intrusive walkover assessment of the project area.

A preliminary methodology study is conducted to identify significant fossil-bearing layers within the study area. This study incorporates data from published scientific materials, previous palaeontological impact assessments (see reference list), and consultations with palaeontology specialists. Based on the collected literature, a preliminary assessment is made to determine the palaeontological sensitivity of the strata. The palaeontological sensitivity map, and geological and Google Earth Satellite imagery are used to locate specific areas of interest. Following the desktop study, a non-intrusive site walkover is conducted during which GPS coordinates are recorded and photographs taken to document the findings at the locations of these GPS points. After the field survey, the GPS points are imported into Google Earth, creating a project area map with all GPS points. Collectively all data is used to generate this report.

1.5. ASSUMPTIONS AND LIMITATIONS

The effectiveness and precision of palaeontological specialist studies, as integral components of heritage impact assessments, are limited by several factors, as outlined by Almond (2014). These limitations encompass the absence of a comprehensive South African fossils heritage database, varying accuracy levels in geological maps – which in turn affect the reliability and precision of desktop studies, insufficient explanations accompanying geological maps, unavailability of published palaeontological materials, and the lack of a dependable database cataloguing fossil collections within South African institutions.

Neglecting on-site walkovers while conducting palaeontological desktop studies can significantly undermine the reliability and precision of the study, resulting in overlooked palaeontological significance within proposed development areas and the dissemination of inaccurate information concerning the palaeontological sensitivity of these development zones.

Due to the limited palaeontological studies conducted in most regions of South Africa (RSA), a palaeontological desktop study typically involves extrapolating the presence of buried fossil heritage within the study area based on pertinent fossil data obtained from comparable rock units elsewhere, often from distant localities. However, when substantial exposures of bedrock or potentially fossil-rich superficial sediments exist in the study area, the reliability of a palaeontological impact assessment can be greatly improved by incorporating field assessments conducted by experienced palaeontologists (Almond , 2014).

Field surveys, such as in the present study, provide considerable information on our understanding of the geological units present, often providing information on the fossil heritage. The underlying geology in the study area has been classified as part of the Peninsula Formation. The Peninsula Formation is one of several formations in the Table Mountain Group. It is therefore essential to study areas outside the project areas such as riverbanks, erosional gullies, and burrowing pits for information on the underlying strata.

It should be noted that not all assessed areas yield fossils. In most cases, fossils are primarily found embedded in subsurface strata, often covered by surface deposits such as soil and vegetation. Therefore, to observe the subsurface strata, a palaeontologist may examine exposed bedrock in nearby locations, preferably within the vicinity of the study area. Additionally, data obtained from exposures further away from the site can also provide valuable information about the underlying strata.

2. BACKGROUND INFORMATION OF DEVELOPMENT SITE

2.1. GENERAL LOCATION

The project area is situated on Erf 2006, Parsonsvlei, Gqeberha (Port Elizabeth), Nelson Mandela Bay Municipality, Eastern Cape Province. The property is bordered by Burchell Road to the east, and the Takealot Pickup Point Hunters Retreat to the west. The centroid geographical coordinates are 33°56'6.10"S 25°29'20.18" E (Fig. 1).

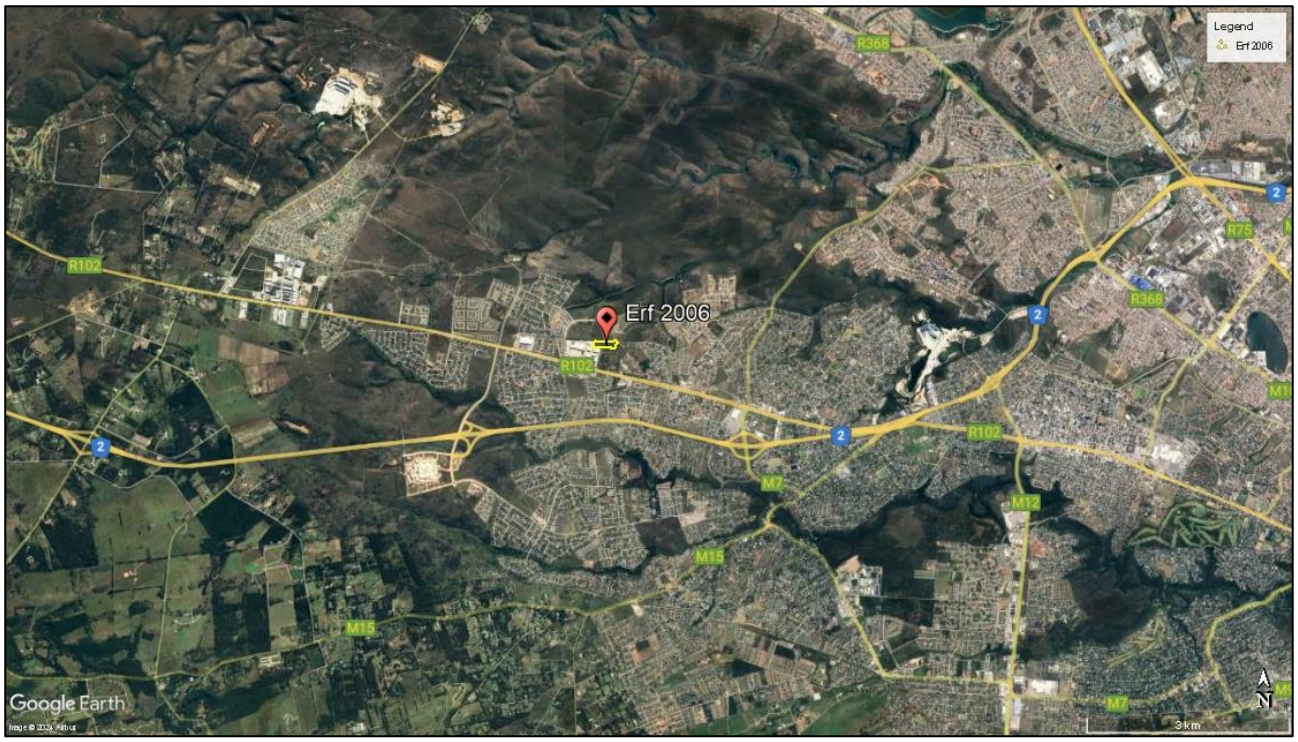

Figure 1: Locality map of the Erf 2006 (redpoint), Nelson Mandela Bay Municipality, Gqeberha, Eastern Cape, South Africa.

3. GEOLOGY

The geology in the project area is shown on the 1:250 000 scale geological map, Port Elizabeth, sheet 3324 (Council for Geoscience, Pretoria; (Toerien & Hill, 1989)) (Fig. 2). The underlying geology forms part of the Cape Supergroup, Table Mountain Group, Peninsula Formation (east of 21^0E) (Johnson, 1976).

The Cape Supergroup is represented by a distinct depositional sequence extending for approximately 850 km along the southwestern and southern coastal regions of South Africa. The geological units of the Cape Supergroup start at the Cederberg, situated 200 km north of the Cape Peninsula, and continue along the southern coastline, ultimately reaching Port Elizabeth, approximately 650 km to the east (Blewett, et al., 2019). Deposition of the Cape Supergroup sediments took place in the Agulhas Sea, a seaway formed because of rifting and extension of the Pan-African belt as Gondwana drifted northwards. Sedimentation took place over a period of approximately 190 Ma (Booth, et al., 1999), from 500 to 330 Ma (Ordovician to Carboniferous).

The Cape Supergroup is subdivided into the Table Mountain Group, Bokkeveld Group and Witteberg Group. Deposition of the Table Mountain Group took place in shallow marine and terrestrial environments (with minor glaciation), whereas sedimentation of the Bokkeveld and Witteberg groups took place in deltaic and shallow marine shelf settings respectively (Rust, 1973). The Table Mountain Group comprises six formations, the Sardinia Bay, Peninsula, Cederberg, Goudini, Skurweberg, and Baviaanskloof (Booth, et al., 1999; Thamm & Johnson, 2006).

3.1. TABLE MOUNTAIN GROUP

3.1.1. PENINSULA FORMATION

The Peninsula Formation comprise resistant sandstone and quartzite, with a maximum thickness of 2700m (Johnson, 1976). This formation is underlain by the conglomerate, sandstone siltstone and shale deposits of the Sardinia Bay Formation. Deposition of the Peninsula Formation sediments predominantly took place in a fluvial succession with minor shallow marine and estuarine intercalations (Broquet, 1992; Thamm & Johnson, 2006).

4. PALAEONTOLOGICAL HERITAGE

The project area has a medium palaeosignificance according to the palaeontological sensitivity map. The Peninsula Formation has scarce fossil remains, the most abundant fossils being trace fossils.

4.1. TABLE MOUNTAIN GROUP

4.1.1. PENINSULA FORMATION

South Africa's Eastern Cape Province provides limited insight into the fossils from the Peninsula Formation because of the structural complexity and high levels of tectonic deformation. Fossils recorded from this province have been recognised as trace fossils in the form of trails, trackways (arthropod) and burrows (Skolithos) (Rust, 1973). Most of the fossils recorded in this formation are from outcrops in the Western Cape Province (Rust, 1967; Potgieter & Oelofsen, 1983; Broquet, 1990; Thamm & Johnson, 2006).

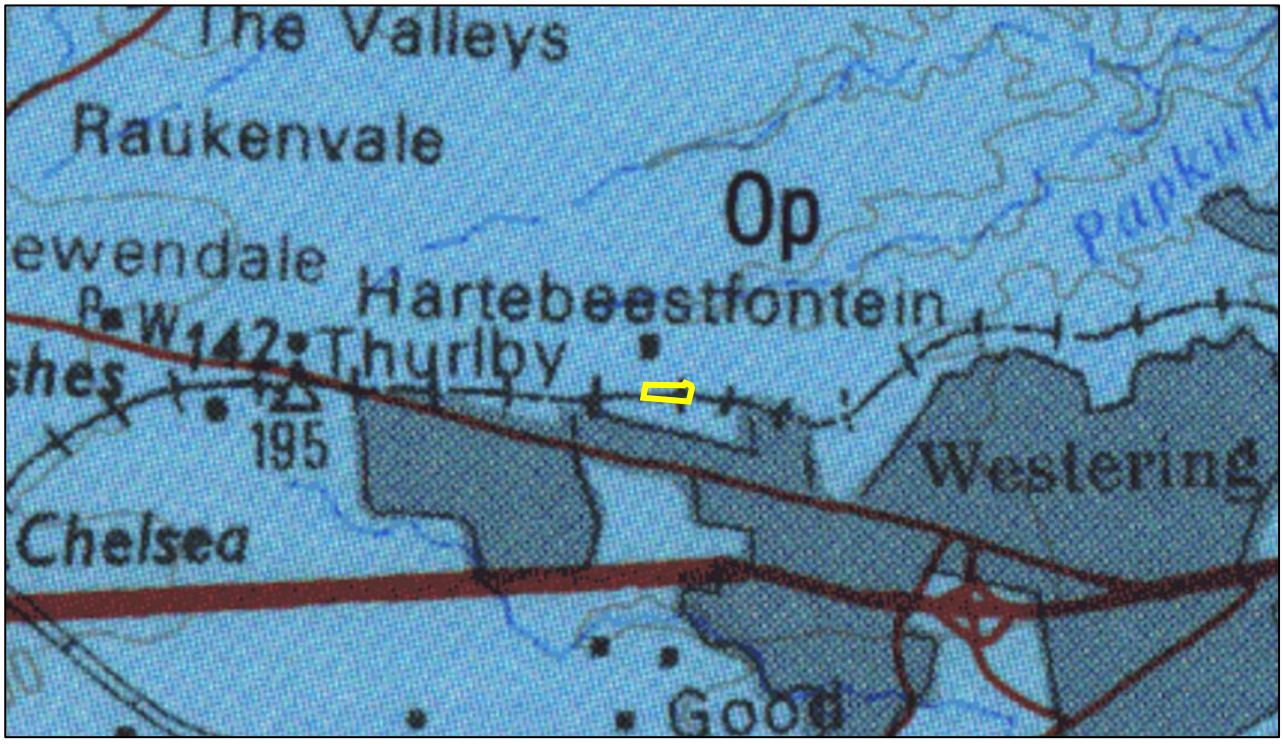

Figure 2: 1:250 000 scale geological map, Port Elizabeth, sheet 3324 (Council for Geoscience, Pretoria; (Toerien & Hill, 1989) showing the underlying geological unit for the proposed development area (yellow polygon – Erf 2006). The geological unit is part of the Peninsula Formation (Op).

5. FIELD SURVEY

A non-intrusive site investigation was conducted on the 20th of April 2024. Large boulders of excavated quartzite are present along the northeastern part of the property (Fig. 3, Point 1). Quartzites were also found in situ at Point 2 (Fig. 5) and Point 5 (Fig. 8). The orientation of the quartzite outcrops show that the units extend laterally in an east-west direction. The quartzite exposures are herein classified as part of the Peninsula Formation as depicted on the geological map (Fig. 2). No remains of any fossils were identified within and outside the boundaries of the current project area.

The project area is largely covered with low-growing vegetation and has a relatively flat topography (Fig. 6, Fig. 7).

Figure 3: Aerial photograph of the proposed development site showing the GPS track (blue) as well as the recorded GPS coordinates (yellow pins).

Figure 4: Photograph was taken on the northeastern side of the project area (Point 1), facing west. The image shows the large boulders of excavated quartzite.

Figure 5: The photograph was taken in the northern centre part of the project area (Point 2), facing southwest. The image shows exposed quartzite overlain unconsolidated soil.

Figure 6: Photograph taken towards the northwestern part of the project area (Point 3). The image shows the flat topography in the area covered with low-growing vegetation.

Figure 7: Photograph of the southwestern part of the project area (Point 4), facing west. The image shows the low-growing vegetation as well as ex situ quartzite boulders.

Figure 8: Photograph of the central-eastern part of the project area (Point 5). The image shows exposed quartzite overlain unconsolidated soil.

6. IDENTIFICATION OF PALAEOSENSITIVITY AND RECOMMENDATIONS

6.1. PALAEOSENSITIVITY

The palaeosensitivity of the area has been classified as medium (SAHRIS website). The proposed development site is situated in a geological formation characterized by a limited presence of fossil-bearing strata within the Peninsula Formation (Almond, et al., 2008).

The development plan for this site involves the excavation of superficial sediments, extending several meters below the surface, and this process may entail the exposure of fresh sediment layers. Such actions potentially pose a risk to the preservation of palaeontological resources in the immediate vicinity. The field assessment indicates that the current project area has a low palaeosensitivity.

Considering this assessment, it is worth noting that the proposed development is considered both feasible and appropriate for this location, with no foreseen adverse impacts on the palaeontological heritage of the region.

6.2. RECOMMENDATIONS

Although no pre-excavation mitigation is necessitated the following recommendations are put forth:

- The ECO should be aware of any fossils that may be present, or any fossils that may be uncovered during excavation.
- The construction managers should be aware of any fossils that may be present.
- Construction should remain within the project area.

- Any exposures encountered during the excavation must be inspected for fossil remains and if any are present a qualified palaeontologist should immediately be notified.
- The remains of trace fossils and invertebrates are of palaeontological interest and must be recorded and sampled by the palaeontologist at the developer's expense.

7. CONCLUSIONS

The project area falls within the Ordovician-aged strata of the Peninsula Formation. The Peninsula Formation has proved to contain a limited assortment of trace fossils (burrows and trackways), as well as organic-walled microfossils. These tend to be linked to the sporadic, marine-influenced mudrock layers.

The proposed development site has been categorised as having a medium palaeosensitivity. However, based on the lack of fossil evidence in the area, the current assessment suggests that the project area has a low palaeontological sensitivity.

The development of the area will involve the excavation of superficial sediments extending several meters below the surface. Field assessments and existing research support the classification of the project area as having low paleontological significance. Consequently, the development is deemed feasible without adverse effects on local palaeontology.

In the event of fossil material discovery during site excavation, immediate notification to the Environmental Control Officer (ECO) is required, who will then engage a palaeontological specialist to assess the findings and their significance.

8. REFERENCES

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APPENDIX 1: DECLARATION

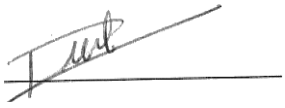
I, Ryan Nel, declare that –

- I act as the independent 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 environmental 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 regulation 8 of the regulations 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 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;
- II will perform all other obligations as expected from an environmental assessment practitioner in terms of the Regulations; and
- I realise that a false declaration is an offence and is punishable in terms of section 24F of the Act.

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 Amendments to Environmental Impact Assessment Regulations, 2014 as amended.

I Ryan Nel, was appointed as a registered (SACNASP, registration no 132881) Geologist/Palaeontologist to conduct a Palaeontological Impact Assessment of the area with no other intentions.



Ryan Nel Pr.Sci.Nat

SACNASP Reg. No. 132881(Geological Science)

APPENDIX 2: CV

Summary:

Ryan Nel, M.Sc., Pr. Sci. Nat (Geological science) has a master's degree in Geology from the University of the Free State, Bloemfontein, South Africa. His masters research focused on the carbonate siliciclastic Precambrian aged rocks of the Cango Caves Group, north of Oudtshoorn, and equipped him with an understanding of geology and palaeontology. He is currently enrolled for his PhD in Geology (Palaeontology) at Rhodes University, Eastern Cape, Makhanda. His PhD research focuses on the palaeogeographic distribution, morphology, anatomy, and phylogeny of mid to late Devonian placoderms from the Givetian aged Klipbokkop Formation and Famennian aged Witpoort Formation of the Cape Supergroup. He conducts his research under the supervision of Dr. R.W. Gess (Rhodes University) and co-supervisor, Prof. Kate Trinjastic (Curtin University).

He has been employed at the University of the Free State as an academic facilitator and as a student assistant for the mineralogy second-year course for three years. During his employment period he was also involved in administrative duties. Ryan also holds a PGCE (Post Graduate Certificate in Education) from the University of South Africa, he taught geography, mathematics, and science for two years in Queenstown in the Eastern Cape province of South Africa.

Since 2021 Ryan has been assisting Dr. R.W. Gess with Palaeontological Impact Assessments for developments in various provinces in South Africa. He has been conducting independent palaeontological impact assessments.

Ryan is a member of the PSSA (Palaeontological Society of South Africa), GSSA (Geological Society of South Africa), PalAss (Palaeontological Association) and registered at SACNASP (South African Council of Natural Scientific Professions) as a Professional Geological Scientist.