Proposed construction of Pluto-Mahikeng 400 kV powerline deviation, Northwest Province

PALAEONTOLOGICAL IMPACT ASSESSMENT

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For:

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1. Executive summary

The underlying geology of Study Site 1 is dominated by dolomite and chert of the Malmani Subgroup. It is impossible to predict where Plio-Pleistocene cave infills, or significant stromatolite formations may occur in the dolomite of the Malmani Subgroup and therefore development should be undertaken with caution.

Study Site 2 is underlain by Tertiary-aged calcrete. The fossil content of this geological unit is extremely rare and it is highly unlikely that any fossils will be found at the site during development.

In the unlikely event that fossils are uncovered during development, the ECO should follow the guidelines as stipulated under the Chance Find Procedure on pp. 19-20.

2. Introduction

The Heritage Act of South Africa stipulates that fossils and fossil sites may not be altered or destroyed. The purpose of this document is to detail the probability of finding fossils in the study area that may be impacted by the proposed development.

The palaeontological heritage of South Africa is unsurpassed and can only be described in superlatives. The South African palaeontological record gives us insight in inter alia the origin of dinosaurs, mammals and humans. Fossils are also used to identify rock strata and determine the geological context of the subregion with other continents and played a crucial role in the discovery of Gondwanaland and the formulation of the theory of plate tectonics. Fossils are also used to study evolutionary relationships, sedimentary processes and palaeoenvironments.

South Africa has the longest record of palaeontological endeavour in Africa. South Africa was even one of the first countries in the world in which museums displayed fossils and palaeontologists studied earth history. South African palaeontological institutions and their vast fossil collections are world-renowned and befittingly the South African Heritage Act is one of the most sophisticated and best considered in the world.

Fossils and palaeontological sites are protected by law in South Africa. Construction in fossiliferous areas may be mitigated in exceptional cases but there is a protocol to be followed.

This is a Palaeontological Impact Assessment that was prepared in line with the South African Heritage Resources Act (Act 25 of 1999) and Appendix 6 of the Environmental Impact Assessment Regulations 2014 as amended and the General Assessment Protocol for Site Sensitivity Verification. This involved an overview of the literature on the palaeontology and associated geology of the area and a site visit for a Palaeontological Impact Assessment.

3. Terms of reference for the report

According to the South African Heritage Resources Act (Act 25 of 1999) (Republic of South Africa, 1999), certain clauses are relevant to palaeontological aspects for a terrain suitability assessment.

- **Subsection 35(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 which assist with the detection or recovery of metals or archaeological material or objects, or use such equipment for the recovery of meteorites.
- **Subsection 35(5)** When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedures 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 for the purpose of obtaining 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 form 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.

South Africa's unique and non-renewable palaeontological heritage is protected in terms of the NHRA. According to this act, heritage resources may not be excavated, damaged, destroyed or otherwise impacted by any development without prior assessment and without a permit from the relevant heritage resources authority.

As areas are developed and landscapes are modified, heritage resources, including palaeontological resources, are threatened. As such, both the environmental and heritage legislation require that development activities must be preceded by an assessment of the impact undertaken by qualified professionals. Palaeontological Impact Assessments (PIAs) are specialist reports that form part of the wider heritage component of:

- Heritage Impact Assessments (HIAs) called for in terms of Section 38 of the National Heritage Resources Act, Act No. 25, 1999 by a heritage resources authority.
- Environmental Impact Assessment process as required in terms of other legislation listed in s. 38(8) of NHRA;
- Environmental Management Plans (EMPs) required by the Department of Mineral Resources.

HIAs are intended to ensure that all heritage resources are protected, and where it is not possible to preserve them in situ, appropriate mitigation measures are applied. An HIA is a comprehensive study that comprises a palaeontological, archaeological, built environment, living heritage, etc specialist studies. Palaeontologists must acknowledge this and ensure that they collaborate with other heritage practitioners. Where palaeontologists are engaged for the entire HIA, they must refer heritage components for which they do not have expertise on to appropriate specialists. Where they are engaged specifically for the palaeontology, they must draw the attention of environmental consultants and developers to the need for assessment of other aspects of heritage. In this sense, Palaeontological Impact Assessments that are part of Heritage Impact Assessments are similar to specialist reports that form part of the EIA reports.
The standards and procedures discussed here are therefore meant to guide the conduct of PIAs and specialists undertaking such studies must adhere to them.
The process of assessment for the palaeontological (PIA) specialist components of heritage impact assessments, involves:

Scoping stage in line with regulation 28 of the National Environmental Management Act (No. 107 of 1998) Regulations on Environmental Impact Assessment. This involves an **initial assessment** where the specialist evaluates the scope of the project (based, for example, on NID/BIDs) and advises on the form and extent of the assessment process. At this stage the palaeontologist may also decide to compile a **Letter of Recommendation for Exemption from further Palaeontological Studies**. This letter will state that there is little or no likelihood that any significant fossil resources will be impacted by the development. This letter should present a reasoned case for exemption, supported by consultation of the relevant geological maps and key literature.

A **Palaeontological Desktop Study** – the palaeontologist will investigate available resources (geological maps, scientific literature, previous impact assessment reports, institutional fossil collections, satellite images or aerial

photos, etc) to inform an assessment of fossil heritage and/or exposure of potentially fossiliferous rocks within the study area. A Desktop studies will conclude whether a further field assessment is warranted or not. Where further studies are required, the desktop study would normally be an integral part of a field assessment of relevant palaeontological resources.

A **Phase 1 Palaeontological Impact Assessment** is generally warranted where rock units of high palaeontological sensitivity are concerned, levels of bedrock exposure within the study area are adequate; large-scale projects with high potential heritage impact are planned; and where the distribution and nature of fossil remains in the proposed project area is unknown. In the recommendations of Phase 1, the specialist will inform whether further monitoring and mitigation are necessary. The Phase 1 should identify the rock units and significant fossil heritage resources present, or by inference likely to be present, within the study area, assess the palaeontological significance of these rock units, fossil sites or other fossil heritage, comment on the impact of the development on palaeontological heritage resources and make recommendations for their mitigation or conservation, or for any further specialist studies that are required in order to adequately assess the nature, distribution and conservation value of palaeontological resources within the study area.

A **Phase 2 Palaeontological Mitigation** involves planning the protection of significant fossil sites, rock units or other palaeontological resources and/or the recording and sampling of fossil heritage that might be lost during development, together with pertinent geological data. The mitigation may take place before and / or during the construction phase of development. The specialist will require a Phase 2 mitigation permit from the relevant Heritage Resources Authority before Phase 2 may be implemented.

A **'Phase 3' Palaeontological Site Conservation and Management Plan** may be required in cases where the site is so important that development will not be allowed, or where development is to co-exist with the resource. Developers may be required to enhance the value of the sites retained on their properties with appropriate interpretive material or displays as a way of promoting access of such resources to the public.

The assessment reports will be assessed by the relevant heritage resources authority and depending on which piece of legislation triggered the study, a response will be given in the form of a Review Comment or Record of Decision (ROD). In the case of PIAs that are part of EIAs or EMPs, the heritage resources authority will issue a comment or a record of decision that may be forwarded to the consultant or developer, relevant government department or heritage practitioner and where feasible to all three.

4. Details of study area and the type of assessment

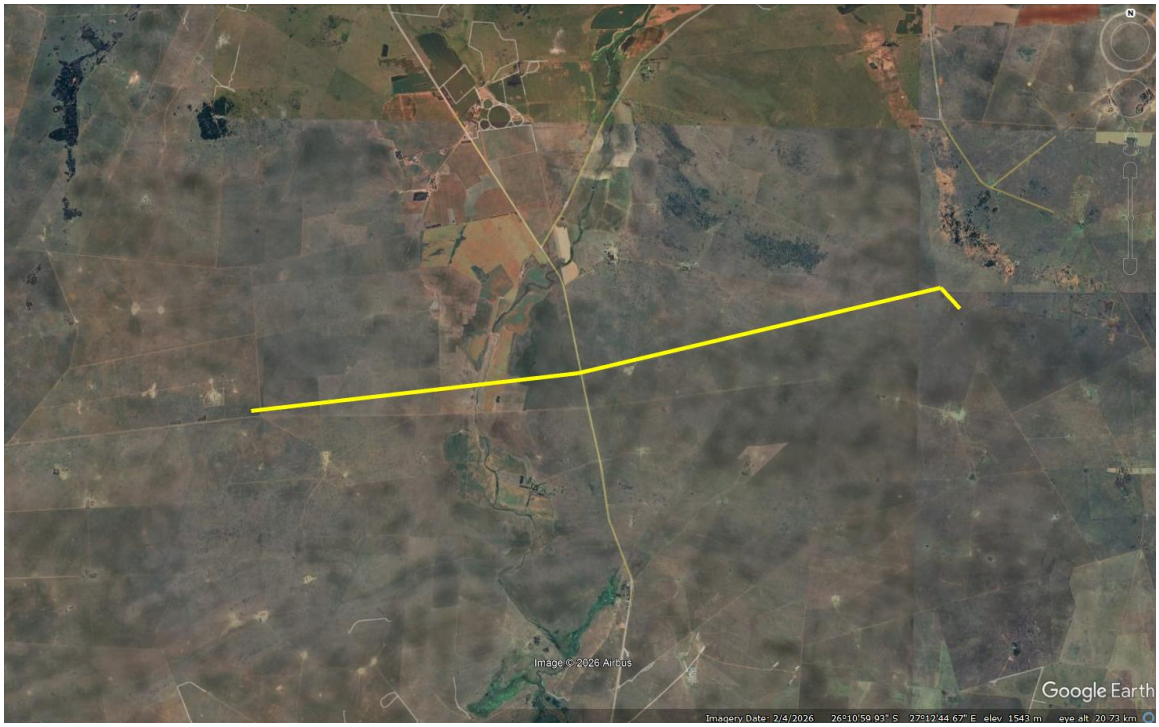


Figure 1: Google Earth photo of Study Site 1 (yellow line)

Study Site 1 is situated on farmland between Ventersdorp and Randfontein north of the N14 in Northwest Province (see Fig. 1).

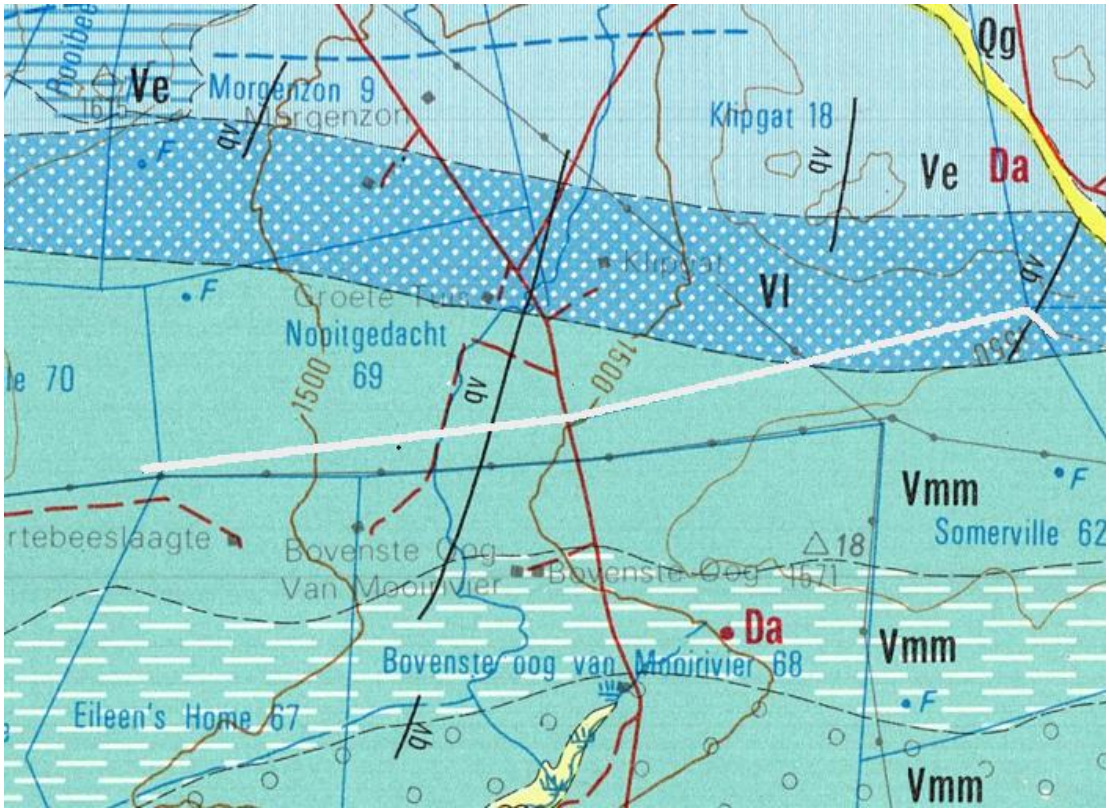


Study Site 2 is situated north of Rooigrond between the R49 and the R 503.

The study area was assessed originally in 2018 (Durand, 2018) and again in March 2026. The relevant literature and geological maps for the region in which the development is proposed to take place, have been studied for a Palaeontological Impact Assessment.

Figure 2: Google Earth photo of Study Site 2 between Pylons 110 and 111 (red line) north of Rooigrond

5. Geological setting of the study area



(White line depicts the study area)

Figure 3: Geological Map of the study area (adapted from the 2626 WEST RAND 1:250 000 Geology Map (Geological Survey, 1986)

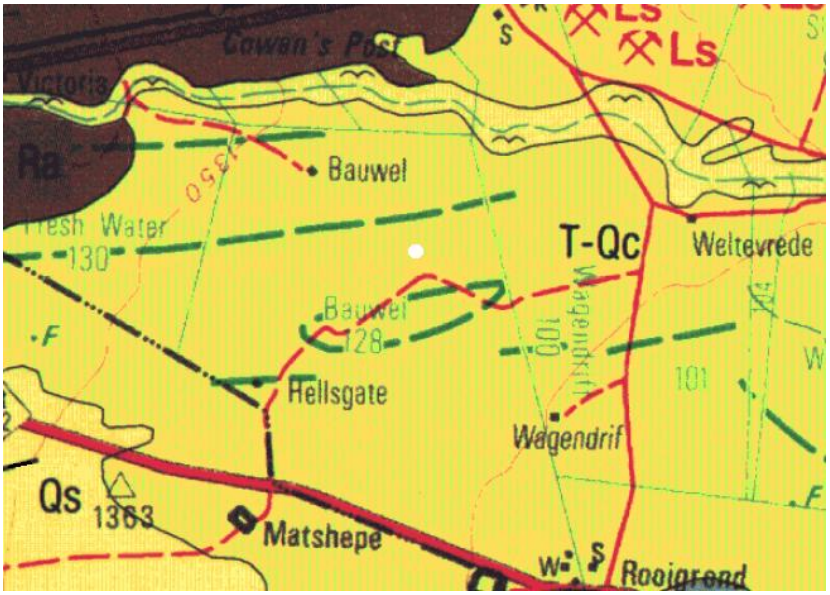


Figure 4: Geological Map of the study area (adapted from the 2524 MAFIKENG 1:250 000 Geology Map (Geological Survey, 1991)

LEGEND:

	Lithology	Stratigraphy				Age
	River sand, alluvium					Quaternary
Qs	Superficial deposits					
Qg	Gravel, diamondiferous in places					
T-Qc	Calcrete					Tertiary
Ve	Chert-rich dolomite, chert and remnants of chert breccia of the Rooihoogte Fmn.	Eccles Formation	Malmani Subgroup	Chuniespoort Group	Transvaal Supergroup	Vaalian
Ve	Chert-rich dolomite, chert					
Vl	Dark chert-poor dolomite	Lyttelton Formation				
Vmm	Chert-rich dolomite	Monte Christo Formation				
Vmm	Chert-rich dolomite, interbedded with banded chert					
Vmm	Chert-rich dolomite, interbedded with oolitic chert					
Ra	Andesitic to basaltic lava, minor tuff	Allan Ridge Formation			Venters-dorp Supergroup	Randian

Study site 1 is mainly underlain by dolomite of the Malmani Subgroup of the Chuniespoort Group of the Transvaal Supergroup (see Fig. 2).

The Transvaal Supergroup overlies the Ventersdorp Supergroup discordantly. The area occupied by the Witwatersrand Basin sediment was eroded heavily by

an extensive northwards-flowing river system more than 2.2 Ga (Viljoen and Reimold, 2002). The channels formed by this river system were filled in by the sediments which consolidated into the Black Reef (McCarthy and Rubidge, 2005).

The Chuniespoort Group of the Transvaal Supergroup overlies the Black Reef Formation. The Chuniespoort Group consists of chemical and biochemical sediments including stromatolitic carbonates and banded ironstone. This unit which is approximately 1200-2000m thick in Gauteng and Northwest Province was set down during the transgression of the Transvaal Supergroup epeiric sea approximately 2.67 – 2.46 Ga (Eriksson et al., 2001).

The carbonates which were set down 2.643 - 2.520 Ga (Obbes, 2000) are subdivided into several formations most of which were dolomitised and partially silicified (Eriksson and Reczko, 1995). The Transvaal Supergroup rocks include quartzite, mudstone, shale, siltstone, conglomerate, limestone, diamictite, tuff and andesite suggesting a range of depositional sources ranging from alluvial fans, floodplains, deltas to coastal and deep basinal environments (Eriksson et al, 2009).

The Plio-Pleistocene palaeontological sites in South Africa are situated within the Malmani Subgroup dolomites in the northern part of South Africa. The abundance of the dolomitic caves in this geological unit is the main reason for the concentration of heritage resources in the Cradle of Humankind World Heritage Site situated to the west of the study site.

Study Site 2 is underlain by calcrete. The calcrete of the study site is part of pedocrete development that took place over a much larger area in the interior during the Triassic (Partridge et al., 2009).

6. Site Visit



Figure 5: Study site seen from: 26°09'56.49"S 27°09'28.07"E



Figure 6: Chert-rich dolomite exposed at: 26°10'00.81"S 27°05' 47.45"E



Figure 7: Study site seen from: 26°09'56.57"S 27°09'29.32"E

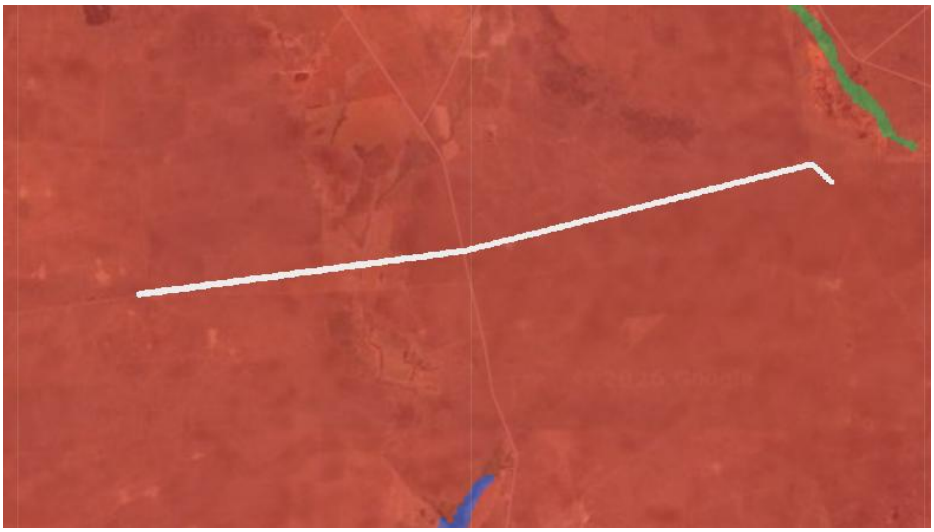


Figure 8: Dolomite exposed at: 26°09'57.04"S 27°09'30.55"E



Figure 9: Chert-rich dolomite exposed at: 26°09'14.90"S 27°10' 52.93"E

7. Palaeontological potential of the study area



(Study site indicated by white line)

Figure 10: Palaeosensitivity map (SAHRA, 2026) of Study Site 1



Study site indicated by white line

Figure 11: Palaeosensitivity map (SAHRA, 2026) of Study Site 2

KEY		
COLOUR	SENSITIVITY	REQUIRED ACTION
Red	Very High	Field assessment and protocol for finds are required.
Orange	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.

Site 1:

The Plio-Pleistocene palaeontological sites in South Africa are situated within the Malmani Subgroup dolomites in the northern part of South Africa. The abundance of the dolomitic caves in this region is the main reason for the concentration of heritage resources in the Cradle of Humankind World Heritage Site. Although hundreds of fossil sites have been discovered in the Malmani Subgroup dolomite cave infills, none have been discovered in the area between Magaliesburg and Ventersdorp so far. The importance of these fossil sites, that yielded hundreds of thousands of fossils, including hominin fossils, cannot be overstated and is the main reason why the study area is regarded as having a Very High Palaeontological Sensitivity (SAHRA, 2026).

In addition to the Plio-Pleistocene fossils in prehistoric cave infills, the dolomite itself contains stromatolite formations that are the fossilised remains of cyanobacterial mats that covered the sea floor approximately 2.643 - 2.520 Ga ago (Obbes, 2000). Cyanobacteria were the first photosynthesizing organisms and it is thought that the chloroplast found in plants has evolved from a cyanobacterial ancestor. Cyanobacteria released oxygen as a by-product of photosynthesis in such quantities that it irrevocably changed the atmosphere from a reducing to an oxidizing atmosphere which had a devastating effect to most bacteria which were and still are anoxic. On the other hand, eukaryotic organisms such as fungi, plants and animals would not have been able to exist without the oxygen in the atmosphere and would therefore not have evolved if it were not for cyanobacteria. Stromatolites are therefore very important from an evolutionary, environmental, ecological and geological perspective.

The geology in the study area is mostly obscured with soil and vegetation (Figs. 5-9), the only geological evidence available was in the form of minor outcrops of dolomite and chert-rich dolomite (Figs. 6, 8, 9). Although no fossil specimens were found at the study site, it does not exclude the possibility of discovering fossil sites once the soil and vegetation is cleared and the underlying bedrock is exposed during excavations for construction.

Site 2:

The Tertiary-aged calcrete of the study area may contain fossil pollen, root casts and termitaria, rare bones, ostrich shell fragments, tortoise shell fragments, mollusc shells and freshwater stromatolites. These fossils are rare and unevenly distributed in the Cenozoic deposits of the interior (Groenewald & Groenewald, 2014).

Impact Assessment and Mitigation Measures (see Appendix 1 & 2)

Site 1:

The significance of impacts is determined using the following criteria:

Extent: The physical extent of impacts on potential palaeontological resources relates directly to the extents of subsurface disturbance. The extent of impacts for the proposed development is LOCALISED.

Duration: If fossils are found they should be preserved for posterity. Whether they are destroyed during development of collected to take to a museum, the duration of impact is PERMANENT.

Intensity: The intensity/magnitude of a palaeontological impact is determined by the palaeontological sensitivity of the affected geological formation, together with the extent or volume of excavations made into the formation. Development of this site will most probably expose stromatolite formations underground, with the further possibility of uncovering Plio-Pleistocene fossils. The intensity of the impact on the fossils that may occur at the study sites is therefore considered to be HIGH.

Probability: (describes the likelihood of the impact actually occurring)
The probability of discovering well-preserved stromatolite formations increases when the overburden and eroded rocks are stripped from the bedrock.

It is IMPROBABLE that intact stromatolite structures will be found in the study areas when development occurs due to the limited depth of the excavations, the deep soils at the study area and the chemical weathering of subsurface dolomite, it is IMPROBABLE that cave fills with Plio Pleistocene fossils will be found due to its scarcity.

IMPACT ASSESSMENT TABLE					
Extent	Duration	Intensity	Probability	Significance	Status
1	5	8	2	(1+5+8) x 2 = 28	LOW
Significance Sum (Extent + Duration + Intensity) x Probability					

Results:

Plio-Pleistocene fossils that include hominin and other prehistoric mammal fossils are exceptionally important from a scientific, educational and tourism perspective. Stromatolites on the other hand are the subject of scientific research on the palaeoclimatic conditions of the early earth, the origin of photosynthesis and the origin of the oxygen-rich atmosphere. Where possible these fossils should be preserved. The impact on the palaeontology of the study site is considered to be LOW which implies that, although the Plio-Pleistocene fossils and stromatolites are scientifically very important, the chances of finding fossils are low. The effect of the impact will be mitigated in the unlikely event of exposing bone fossils or well-

preserved stromatolites during development, if the Change Find Procedures are followed.

Site 2:

The significance of impacts is determined using the following criteria:

Extent: The physical extent of impacts on potential palaeontological resources relates directly to the extents of subsurface disturbance. The extent of impacts for the proposed development is LOCALISED.

Duration: If fossils are found they should be preserved for posterity. Whether they are destroyed during development of collected to take to a museum, the duration of impact is PERMANENT.

Intensity: The intensity/magnitude of a palaeontological impact is determined by the palaeontological sensitivity of the affected geological formation, together with the extent or volume of excavations made into the formation. The intensity of the development at this study site will be LOW due to the scarcity and fragmentary nature of the fossils in this formation and the limited area of the study site and the nature of development that will take place.

Probability: (describes the likelihood of the impact actually occurring)
It is possible but IMPROBABLE that well-preserved vertebrate bones, termitaria, ostrich shells fragments and mollusc shells will be found at this site, due to its scarcity and sparse distribution.

IMPACT ASSESSMENT TABLE					
Extent	Duration	Intensity	Probability	Significance	Status
1	5	4	2	(1+5+4) x 2 = 20	LOW
Significance Sum (Extent + Duration + Intensity) x Probability					

Results:

Fossils in the Tertiary-aged calcrete of the interior are extremely rare and none have been reported from the region. It is highly improbable that anything will be encountered during development at this site. The effect of the impact will be mitigated in the unlikely event of exposing bone fossils or well-preserved stromatolites during development, if the Change Find Procedures are followed.

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SAHRA (2026) Palaeosensitivity Map https://sahris.org.za/map/palaeo

8. Conclusion and recommendations

Study Site 1 is mainly underlain by dolomite of the Malmani Subgroup of the Chuniespoort Group. Although fossils are not found distributed ubiquitously in the Malmani Subgroups rocks, there are pockets where large collections of Plio-Pleistocene fossils have been found. These fossils are of high scientific importance and should be conserved when discovered.

Although stromatolite formations are very common and not all stromatolites could practically be collected, stored and curated, it would be a loss to science if a particularly well preserved and exceptional stromatolite formation is destroyed during the development process. Although no such exceptional fossil sites were discovered during the field assessment, and none have been reported in the past, there is a possibility of uncovering such fossil sites during excavations and construction at the study site.

Study Site 2 is underlain by Tertiary-aged calcrete. There is a possibility that fossils may occur in this geological unit but it is exceptionally unlikely that anything will be found at this site due to its size (45 m), the type of development and the scarcity of fossils in this unit.

If bone fossils are found in the rocks at the study area, or exceptional stromatolite formations are uncovered, the ECO should take the following steps:

PROCEDURE FOR CHANCE PALAEONTOLOGICAL FINDS

Extracted and adapted from the National Heritage Resources Act, 1999 Regulations Reg No. 6820, GN: 548.

The following procedure must be considered in the event that previously unknown fossils or fossil sites are exposed or found during construction of the powerline:

1. Surface excavations should continuously be monitored by the ECO and any fossil material be unearthed the excavation must be halted.

2. If fossiliferous material has been disturbed during the excavation process it should be put aside to prevent it from being destroyed.

3. The ECO then has to take a GPS reading of the site and take digital pictures of the fossil material and the site from which it came.

4. The ECO then should contact a palaeontologist and supply the palaeontologist with the information (locality and pictures) so that the palaeontologist can assess the importance of the find and make recommendations.

5. If the palaeontologist is convinced that this is a major find an inspection of the site must be scheduled as soon as possible in order to minimise delays to the development.

From the photographs and/or the site visit the palaeontologist will make one of the following recommendations:

a. The material is of no value so development can proceed, or:

b. Fossil material is of some interest and a representative sample should be collected and put aside for further study and to be incorporated into a recognised fossil repository after a permit was obtained from SAHRA for the removal of the fossils, after which the development may proceed, or:

c. The fossils are scientifically important and the palaeontologist must obtain a SAHRA permit to excavate the fossils and take them to a recognised fossil repository, after which the development may proceed.

7. If any fossils are found then a schedule of monitoring will be set up between the developer and palaeontologist in case of further discoveries.

9. Declaration of Independence

I, Jacobus Francois Durand declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



Palaeontological specialist:
Dr JF Durand (Sci. Nat.)
BSc Botany & Zoology (RAU), BSc Zoology (WITS), Museology Dipl. (UP), Higher Education Diploma (RAU), PhD Palaeontology (WITS)

APPENDIX 1: PALAEONTOLOGICAL SENSITIVITY RATING
(Palaeontological Sensitivity refers to the likelihood of finding significant fossils within a geological unit)

VERY HIGH: Formations/sites known or likely to include vertebrate fossils pertinent to human ancestry and palaeoenvironments and which are of international significance.

HIGH: Assigned to geological formations known to contain palaeontological resources that include rare, well-preserved fossil materials important to on-going palaeoclimatic, palaeobiological and/or evolutionary studies. Fossils of land-dwelling vertebrates are typically considered significant. Such formations have the potential to produce, or have produced, vertebrate remains that are the particular research focus of palaeontologists and can represent important educational resources as well.

MODERATE: Formations known to contain palaeontological localities and that have yielded fossils that are common elsewhere, and/or that are stratigraphically long-ranging, would be assigned a moderate rating. This evaluation can also be applied to strata that have an unproven, but strong potential to yield fossil remains based on its stratigraphy and/or geomorphologic setting.

LOW: Formations that are relatively recent or that represent a high-energy subaerial depositional environment where fossils are unlikely to be preserved, or are judged unlikely to produce unique fossil remains. A low abundance of invertebrate fossil remains can occur, but the palaeontological sensitivity would remain low due to their being relatively common and their lack of potential to serve as significant scientific resources. However, when fossils are found in these formations, they are often very significant additions to our geologic understanding of the area. Other examples include decalcified marine deposits that preserve casts of shells and marine trace fossils, and fossil soils with terrestrial trace fossils and plant remains (burrows and root fossils)

MARGINAL: Formations that are composed either of volcaniclastic or metasedimentary rocks, but that nevertheless have a limited probability for producing fossils from certain contexts at localized outcrops. Volcaniclastic rock can contain organisms that were fossilized by being covered by ash, dust, mud, or other debris from volcanoes. Sedimentary rocks that have been metamorphosed by the heat and pressure of deep burial are called metasedimentary. If the metasedimentary rocks had fossils within them, they may have survived the metamorphism and still be identifiable. However, since the probability of this occurring is limited, these formations are considered marginally sensitive.

NO POTENTIAL: Assigned to geological formations that are composed entirely of volcanic or plutonic igneous rock, such as basalt or granite, and therefore do not have any potential for producing fossil remains. These formations have no palaeontological resource potential.

(Adapted from Society of Vertebrate Paleontology (1995). Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontologic Resources - Standard Guidelines. News Bulletin 163: 22-27)

APPENDIX 2:
METHODOLOGY FOR ASSESSING THE SIGNIFICANCE OF IMPACTS

EFFECT	**Extents/Spatial Scale E**		
	Localized	At localized scale and a few hectares in extent.	1
	Study area	The proposed site and its immediate environs.	2
	Regional	District and Provincial level.	3
	National	Country.	4
	International	Internationally.	5
	Duration/Temporal Scale D		
	Very short	Less than 1 year.	1
	Short term	Between 2 to 5 years.	2
	Medium term	Between 5 and 15 years.	3
	Long term	Exceeding 15 years and from a human perspective almost permanent.	4
	Permanent	Resulting in a permanent and lasting change.	5
	Intensity/Magnitude (Palaeontological Sensitivity) I		
	No potential	Formations entirely lacking fossils such as igneous rocks.	0
	Marginal	Limited probability for producing fossils from certain contexts at localized outcrops.	2
	Low	Depositional environment where fossils are unlikely to be preserved, or are judged unlikely to produce unique fossil remains.	4
	Medium	Strong potential to yield fossil remains based on stratigraphy and/or geomorphologic setting.	6
	High	Formations known to contain palaeontological resources that include rare, well-preserved fossil materials.	8
	Very high	Formations/sites known or likely to include vertebrate fossils pertinent to human ancestry and palaeoenvironments and which are of international significance.	10
	Probability/Likelihood P		
	Very improbable	Probably will not happen.	1
	Improbable	Some possibility, but low likelihood.	2
	Probable	Distinct possibility of these impacts occurring.	3
	Highly probable	The impact is most likely to occur.	4
	Definite	The impact will definitely occur regardless of prevention measures.	5

SIGNIFICANCE = (E+D+I) P		
< 30	LOW	The impact would not have a direct influence on the decision to develop in the area.
30-60	MEDIUM	The impact could influence the decision to develop in the area unless it is effectively mitigated.
> 60	HIGH	The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.

SPECIALIST CV

CURRICULUM VITAE (CV)

Position Title:	Palaeontologist
Name of Expert:	Francois Durand
Date of Birth:	13-Dec-1960
Country of Citizenship/Residence	South Africa

Education:

Institution	Degree(s) or Diploma(s) obtained	Date obtained
Rand Afrikaans University	BSc Botany & Zoology	1983
University of the Witwatersrand	BSc Honours Zoology	1984
University of the Witwatersrand	PhD Palaeontology	1990
University of Pretoria	Post-graduate Diploma in Museology	1993
Rand Afrikaans University	Higher Education Diploma	2001

Employment record relevant to the assignment:

Period	Employing organization and your title/position. Contact information for references	Country	Summary of activities performed relevant to the Assignment
1988-1998	Council for Geoscience (palaeontologist)	South Africa	Palaeontology
1998-present	Rand Afrikaans University. Lecturer (1998 – 2004) University of Johannesburg. Senior lecturer (2004 – 2017), Assistant Professor (2017 – present)	South Africa	Teaching & Research (palaeontology, ecology)

Membership in Professional Associations:

- Professional Scientist, the South African Council for Natural Scientific Professions (Pr.Sci.Nat. Fields: Zoological Sciences, Earth Sciences), Registration number: 400095/05.
- Palaeontological Society of Southern Africa (1986-present)

Publications:

J.F. Durand (1991) A revised description of the skull of *Moschorhinus* (THERAPSIDA, THEROCEPHALIA), *Annals of the South African Museum*, 99(11): 381-413.

Durand, J.F. (1995) Evolution and Fundamentalism, In: C.W. du Toit (Editor), *Nature, God and Humanity*, Proceedings of the third seminar of the South African Science and Religion Forum, University of South Africa, Pretoria, pp.244-258.

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Durand, J.F. (2010) Perceptions, behavioural change and education around karst. Report KV 241/10, Water Research Commission. *The Karst System of the Cradle of Humankind World Heritage Site*, pp.163-176.

Durand, J.F. (2012) The impact of gold mining on the Witwatersrand on the rivers and karst system of Gauteng and North West Province, South Africa. *Journal of African Earth Sciences* 68:24–43.

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Adequacy for the Assignment:

Detailed Tasks Assigned on Consultant's Team of Experts:	**Reference to Prior Work/Assignments that Best Illustrates Capability to Handle the Assigned Tasks**
	Name of assignment/project: Proposed second 400 kV line from Kronos substation to Hydra substation, Northern Cape **Year:** 2023 **Activities performed:** assessment of palaeontological sensitivity of the site earmarked for development, palaeontological mitigation protocols for development

	Name of assignment/project: Mining development at Kameelhoek west of Postmasburg, Northern Cape **Year:** 2022 **Activities performed:** assessment of palaeontological sensitivity of the site earmarked for development, palaeontological mitigation protocols for development
	Name of assignment/project: Belgrade subsidised housing development, Uphongolo District Municipality, KwaZulu-Natal **Year:** 2021 **Activities performed:** assessment of palaeontological sensitivity of the site earmarked for development, palaeontological mitigation protocols for development
	Name of assignment/project: Development of Khutsong Hostel & Khutsong Ext. 8, North West Province **Year:** 2020 **Activities performed:** assessment of palaeontological sensitivity of the site earmarked for development, palaeontological mitigation protocols for development
	Name of assignment/project: Development at The Shed in the Cradle of Humankind World Heritage Site, Gauteng **Year:** 2016 **Activities performed:** assessment of palaeontological sensitivity of the site earmarked for development, palaeontological mitigation protocols for development
	Name of assignment/project: Quarry development at Deberha, Eastern Cape **Year:** 2016 **Positions held:** palaeontologist **Activities performed:** assessment of palaeontological sensitivity of the site earmarked for development, palaeontological mitigation protocols for development

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Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and I am available, as and when necessary, to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Client, and/or sanctions by the Bank.



Jacobus Francois Durand		07 March 2026
Name of Expert	Signature	Date