Appendix H

PALAEONTOLOGY IMPACT ASSESSMENT

Palaeontological Impact Assessment for the proposed Merafong Solar Photovoltaic (PV) Facility between Carletonville and Westonaria, Gauteng Province

WSP project No: 41106080

Site Visit (Phase 2)

Subcontracted by

Beyond Heritage (Pty) Ltd

23 March 2025

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1. Executive Summary

A Palaeontological Impact Assessment was requested for the proposed Merafong Solar PV Facility to be situated east of Carletonville and west of Westonaria within the Merafong City Local Municipality in the West Rand District Municipality of Gauteng. It will be on part of Farm 355 IQ, and is expected to generate up to 140MW of energy and will occupy 546 Ha. The applicant is also considering a loop-in-loop-out connection from the onsite substation to the existing transmission powerline.

To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a site visit and walkdown Palaeontological Impact Assessment (PIA) was completed for the proposed development.

The proposed site lies mostly on the highly sensitive Vryheid Formation and partly on he very highly sensitive Malmani Subgroup dolomites that might preserve trace fossils such as stromatolites. The site visit conducted on 12 August 2024 (winter) by palaeontologists confirmed that there were NO FOSSILS of any kind in the project footprint, on the land surface. Since it is not known what lies below the surface a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no further palaeontological impact assessment is required unless fossils are found by the contractor, environmental officer or other designated responsible person once excavations, drilling or mining activities have commenced.

The impact pre-mitigation is LOW and post-mitigation is VERY LOW.
As far as the palaeontology is concerned, the project should be authorised. There are no no-go areas, there are no buffers required, there is no cumulative impact and there is no preferred route for the grid connection.

ASPECT	SCREENING TOOL SENSITIVITY	VERIFIED SENSITIVITY	OUTCOME STATEMENT/ PLAN OF STUDY	RELEVANT SECTION MOTIVATING VERIFICATION
Palaeontology	Very High	Low	Palaeontological Impact Assessment	Section 7.2. SAHRA Requirements

2. **Declaration of independence and summary of expertise**.

a. Declaration

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Beyond Heritage (Pty) Ltd, for WSP, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision-making process for the Project.

Specialist: Prof Marion Bamford

Signature: 

b. Expertise

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, mASSAf, PSSA
Experience: 36 years research and lecturing in Palaeontology; over 28 years PIA studies and over 450 projects completed.

c. Specialist declaration of independence and statement of objectivity for the assessment.

Declaration of Independence

I, Marion Bamford, declare that –

General declaration:

- I act as the independent palaeontology practitioner in this application,
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant,
- I declare that there are no circumstances that may compromise my objectivity in performing such work,
- I have expertise in conducting palaeontological impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation,
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application,
- I have no, and will not engage in, conflicting interests in the undertaking of the activity,
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority,
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties

and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application,
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct,
- I will perform all other obligations as expected from a heritage practitioner in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations.

d. **Summary of the specialist's expertise**

I, Marion Bamford, am a professional Palaeontologist with a PhD in Palaeontology (Wits University, 1990). I have more than 35 years of experience in palaeontological research and have published over 190 papers in peer-reviewed journals and published more than 14 scholarly book chapters. I review manuscripts for international and local journals and also review funding proposals for international funding bodies. Currently I am the Director of the Evolutionary Studies Institute, the only palaeontological institute in Southern Africa.

I have completed more than 450 palaeontological impact assessments (desktop and site visit studies) in the last 28 years for a variety of projects (solar energy projects, wind energy projects, powerlines, roads, infrastructure, housing and retail projects and from all over South Africa. I have been subcontracted by over 30 different companies. From my own projects and training provided by me and other staff in the ESI for Palaeontological Impact Assessments, I am familiar with the legislation.

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3. Project Background

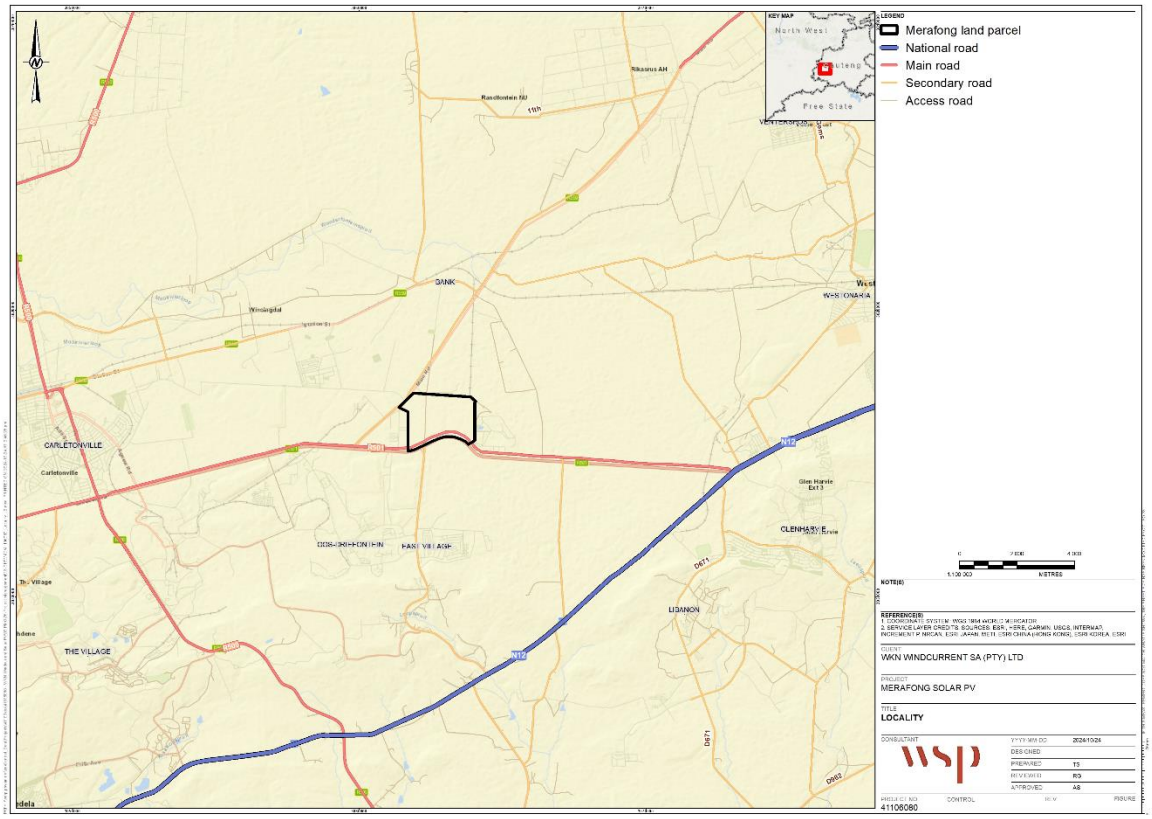

Figure 1: Regional Locality map

The proposed study area is situated east of Carletonville and west of Westonaria within the Merafong City Local Municipality in the West Rand District Municipality of Gauteng, South Africa. The site central coordinates are 26°21'12.68"S; 27°30'48.98"E. The proposed development consists of the main land parcel which will contain the Solar PV facility, two corridor routes (preferred and alternative) each 300m wide which will link to the pre-existing Eskom Midas Substation (Figure 1). The total development extent is approximately 546 ha.

The Solar PV facility has a total footprint of 217ha and will have a total generating capacity of up to 140 megawatts (MW). The proposed solar PV Facility will consist of the following infrastructure:

- Solar Arrays, modules and mounting structures
- Inverters and transformers
- Battery Energy Storage System (BESS) (to be included as part of a separate norms registration process)
- Operation & Maintenance building including a gatehouse, ablution facilities, security building, control centre, offices, warehouses and workshops for storage and maintenance.
- Temporary and permanent laydown area
- Laydown Area
- Facility grid connection infrastructure including:

- 33kV cabling to connect the solar arrays to the IPP Substation
- 33kV/132kV IPP substation
- Internal service and maintenance roads
- Perimeter fencing

A Loop-in Loop-out (LILO) grid connection is proposed which will be subject to a separate registration process.

The following farm portions are affected by the proposed project:

Table 1: Merafong Solar PV Affected Farm Portions

Farm Name	Portion Number	sg 21 code
Driefontein	355	T0IQ00000000035500008
Driefontein	355	T0IQ00000000035500015
Driefontein	355	T0IQ00000000035500013
Driefontein	355	T0IQ00000000035500010
Driefontein	355	T0IQ00000000035500011
Driefontein	355	T0IQ00000000035500012
Driefontein	355	T0IQ00000000035500004
Smallplaats	353	T0IQ00000000035300000
Vlakplaats	112	T0IQ00000000011200000

The Merafong LILO Power Lines & Switching Station are comprised of the following project components:

- 132kV LILO power lines (approximately 700m in length)
- An Eskom Switching Station (approximately 1.57ha)

Project Infrastructure

The project infrastructure associated with the project is detailed in the table below:

Table 2: Project details;

Detail	MERAFONG SOLAR PV
Applicant Name	Merafong Energy (Pty) Ltd
Extent	217 ha
Buildable area	To be confirmed during the EIA phase
Export Capacity	Up to 140MW
Power system technology	Solar
Panels	PV modules and mounting structures (monofacial or bifacial) with fixed, single or double axis tracking mounting structures. Height up to 8m.
Substation	1 ha IPP substation.

Internal Cabling	33kV cabling to connect the panels to the onsite substation, to be laid underground where practical.
Switching substation	1.5 ha switching station.
Construction camp and laydown area	Construction compounds including site office inclusive of: 1 ha temporary, 1 ha permanent
Internal Roads	Up to 8m in width
O&M Building	0.5 ha, OEM, building and parking
BESS	Capacity still to be confirmed The BESS will be housed in containers covering a total approximate footprint of up to 7ha
Grid Connection	
Grid length and connection point	132kV LILO power lines (approximately 700m in length)
Footprints of the substation areas at the start and end of the line – with associated capacities	An Eskom Switching Station (approximately 1.57ha)
Tower options	Single circuit
Width of assessment corridor (distance either side of centre line)	300m width in total, 150m either side of centre line.

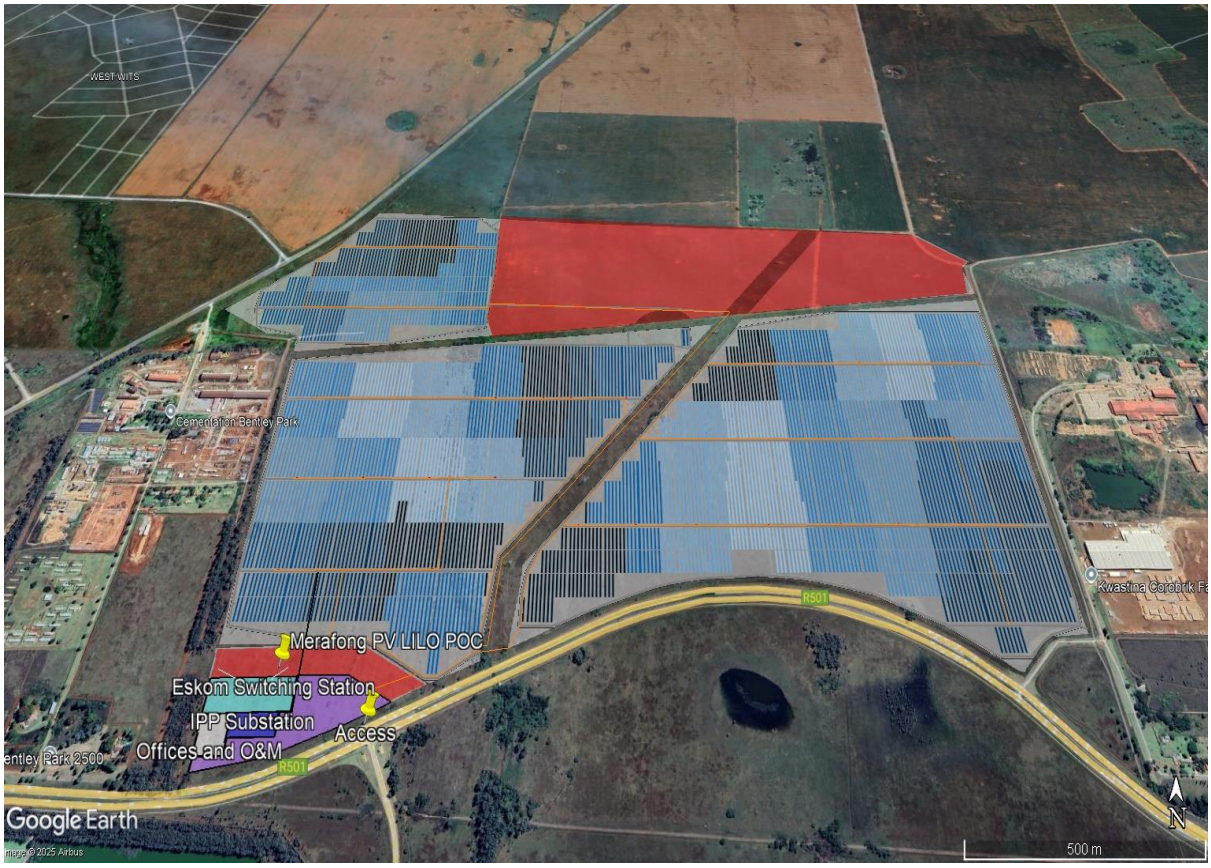

Figure 2: Google Earth map of the proposed layout of the Merafong Solar PV.

A site visit and walkdown Palaeontological Impact Assessment was requested for the Merafong Solar PV project. To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), the site visit observations for the Palaeontological Impact Assessment (PIA) was completed for the proposed development and is reported herein.

Table 3: National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) - Requirements for Specialist Reports (Appendix 6). Includes the requirements from GNR Appendix 6 of GN 326 EIA Regulation 2017.

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
ai	Details of the specialist who prepared the report,	Section 2
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Section 2
b	A declaration that the person is independent in a form as may be specified by the competent authority	Section 2
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 3
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 6
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 4
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 6
g	An identification of any areas to be avoided, including buffers	N/A
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;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7
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 8
k	Any mitigation measures for inclusion in the EMPr	Section 10, Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 10, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	Section 8

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	Relevant section in report
nii	If the opinion is that the proposed activity 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	Sections 8, 10
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies of any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A
2	Where a government notice gazetted 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.	N/A

4. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.
The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources include records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases; eg https://sahris.sahra.org.za/map/palaeo ; DFFE palaeosensitivity screener.
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*applicable to this assessment*);
3. Walkdown to look for fossils on the land surface (no excavations permitted) and any fossils seen must be photographed and GPS coordinates noted.
4. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility, and
5. Determination of fossils' representativity or scientific importance to decide if the fossils can be destroyed or a representative sample collected.
6. If important fossils or fossil sites are encountered recommendation can be made to avoid the site (no-no area), establish a buffer area around the site, or remove the fossils.

5. Geology and Palaeontology

i. Project location and geological context

The site lies in the Transvaal Basin that has exposures of the basal members of the Transvaal Supergroup, and overlies the older rocks of the Witwatersrand Supergroup. Unconformably overlying the Transvaal Supergroup rocks are the much younger basal members of the Karoo Supergroup as this is the northern margin of the Main Karoo Basin. Along the rivers and watercourses are recent deposits of sand and alluvium, of late Quaternary age (Figure 3).

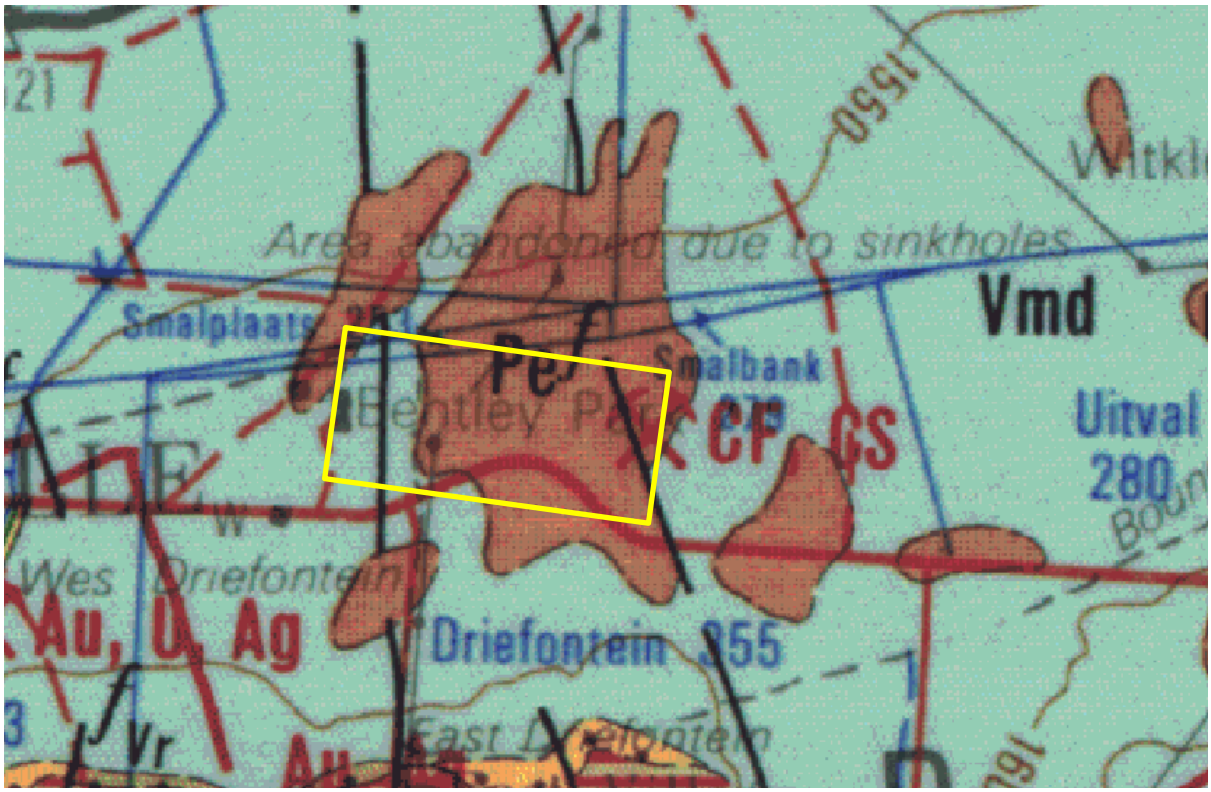

Figure 2: Geological map of the area around the Merafong Solar PV indicated within the yellow outline. Abbreviations of the rock types are explained in Table 4. Map enlarged from the Geological Survey 1: 250 000 map 2626 West Rand.

Table 4: Explanation of symbols for the geological map and approximate ages (Eriksson et al., 2006; Johnson et al., 2006; Zeh et al., 2020). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Pe	Vryheid Fm, Ecca Group, Karoo SG	Shales, sandstone, coal	Early Permian, Ca 290-280 Ma
Vr	Rooihoogte Fm, Pretoria Group, Transvaal SG	Shale	Palaeoproterozoic Ca 2420 Ma
Vt	Timeball Hill Fm, Pretoria Group, Transvaal SG	Quartzite	Palaeoproterozoic < 2420 Ma
Vmd	Malmani Subgroup, Chuniespoort Group, Transvaal SG	Dolomite, chert	Palaeoproterozoic Ca 2750 – 2650 Ma

In the Transvaal Basin the Transvaal Supergroup is divided into two Groups, the lower Chuniespoort Group and the upper Pretoria Group (with ten formations; Eriksson et al., 2006). The Chuniespoort Group is divided into the basal Malmani Subgroup that comprises dolomites and limestones and is divided into five formations based on chert content, stromatolitic morphology, intercalated shales and erosion surfaces. The top of the Chuniespoort Group has the Penge Formation and the Duitschland Formation.

Making up the lower Pretoria Group are the Rooihoogte Formation, Timeball Hill Formation and the Boshoek Formation. The Hekpoort, Dwaalheuwel, Strubenkop and Daspoort Formations form a sequence as the middle part of the Pretoria Group, Transvaal Supergroup, and represent rocks that are over 2060 million years old. The Hekpoort Formation is a massive lava deposit and is overlain by the Dwaalheuwel conglomerates, siltstone and sandstone (not present here). A hiatus separates the Strubenkop Formation slates and shales from the overlying quartzites of the Daspoort Formation. Upper Pretoria Group formations are the Silverton, Magaliesberg, Vermont, Lakenvalei, Nederhorst, Steenkampsberg and Houtenbek Formations

The Karoo Supergroup rocks cover a very large proportion of South Africa and extend from the northeast (east of Pretoria) to the southwest and across to almost the KwaZulu Natal south coast. It is bounded along the southern margin by the Cape Fold Belt and along the northern margin by the much older Transvaal Supergroup rocks. Representing some 120 million years (300 – 183Ma), the Karoo Supergroup rocks have preserved a diversity of fossil plants, insects, vertebrates and invertebrates.

Overlying the basal Dwyka Group glacigene rocks are rocks of the Ecca Group that are Early Permian in age. There are eleven formations recognised in this group but they do not all extend throughout the Karoo Basin. In Gauteng, the Free State, Mpumalanga and KwaZulu Natal, from the base upwards are the Pietermaritzburg Formation, **Vryheid Formation** and the Volksrust Formation. All of these sediments have varying proportions of sandstones, mudstones, shales and siltstones and represent shallow to deep water settings, deltas, rivers, streams and overbank depositional environments.

The Karoo Group sequence is best represented in the Main Karoo Basin but outliers of the Ecca Group occur in isolated basins in the Transvaal Basin where they unconformably overlie the much older rocks of the Transvaal Supergroup. The project lies on one example of an outlier of the Vryheid Formation (Figure 3).

ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 4. The site for development is in the potentially very highly sensitive Malmani Subgroup dolomites (red) that could preserve trace fossils such as stromatolites and microbialites. The highly sensitive Vryheid Formation (orange) could preserve fossil plants of the *Glossopteris* flora.

Stromatolites are the layers upon layers of inorganic materials that were deposited during photosynthesis, namely calcium carbonate, magnesium carbonate, calcium

sulphate and magnesium sulphate. These layers can be in the form of flat layers, domes or columns depending on the environment where they grew (Beukes, 1987). Some environments did not form stromatolites, just layers of limestone that later was converted to dolomite. The algae that formed the stromatolites are very rarely preserved, and they are microscopic so they can only be seen from thin sections studies under a petrographic microscope.

Microbialites (sensu Burne and Moore, 1987) are organo-sedimentary deposits formed from interaction between benthic microbial communities (BMCs) and detrital or chemical sediments. In addition, microbialites contrast with other biological sediments in that they are generally not composed of skeletal remains. Archean carbonates mostly consist of stromatolites. These platforms could have been the site of early O2 production on our planet. Stromatolites are the laminated, organo-sedimentary, non-skeletal products of microbial communities, which may have included cyanobacteria, the first photosynthetic organisms to produce oxygen. Another type of trace fossil has been termed Microbially-induced sedimentary structures (MISS sensu Noffke et al., 2001) or simply 'fossil mats' (sensu Tice et al., 2011). These include swirls, rip-ups, crinkled surfaces and wrinkles that were formed by the mucus extruded by littoral algae or microbes and bound together sand particles. Davies et al. (2016) caution against the assumption that all such structures are microbially induced unless there is additional evidence for microbes in the palaeoenvironment.

Nonetheless, stromatolites and microbialites are accepted as trace fossils of algal colonies. MISS could be microbially or abiotically formed. The oldest stromatolites have been recorded from the Barberton Supergroup that was deposited between 3.55 to ca. 3.20 Ga, and stromatolites still form today in warm, shallow seas (Homan, 2019).

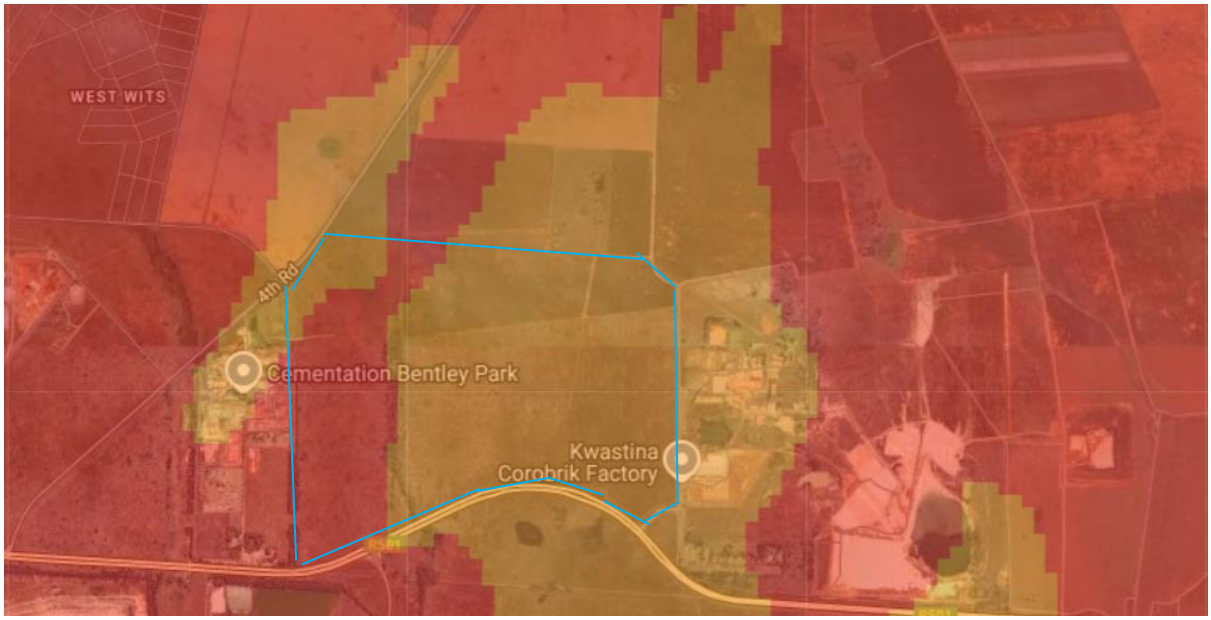

Figure 3: SAHRIS palaeosensitivity map for the site for the proposed Merafong Solar PV shown within the blue outline. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

Fossil plants of the *Glossopteris* flora occur in the Vryheid Formation. This flora includes *Glossopteris* leaves, seeds, fructifications, roots and wood, as well other groups such as the lycopods, sphenophytes, ferns, cordaitaleans and early gymnosperms (Plumstead, 1969; Anderson and Anderson, 1985; Bamford, 2004; Johnson et al., 2006).

iii. Site Visit Observations

The proposed project area is situated about 10 km east of Carletonville, north of the East village area. The proposed project area is a 450ha open field that mainly consists of degraded open grassland. The entire proposed project area was ploughed according the satellite imagery from 2005. A large thicket of eucalyptus trees is situated within the south west quadrant of the area, running from the R501 which borders the southern edge of the project area, towards the central area.

Multiple existing powerlines run across the proposed project area with associated gravel roads crossing through the open fields. The majority of the proposed project area had been burnt just before the survey so there was excellent exposure of the land surface.

The R501 runs along the southern edge of the proposed project area with the R559 running along a section of the north western edge of the proposed project area. The proposed project area is bordered along the western edge by the Cementation Bentley Park and along the eastern edge by the Kwastina Corobrick factory. The northern edge of the project area consists of freshly ploughed fields. Building rubble is scattered throughout the area near the large thickets of trees.

Large depressions are situated within the area. These resemble possible sinkholes that could be a result of past mining activities.

Site visit photographs are presented below in Figures 5-7 with captions and observations.

Figure 5: A-B - General view of the proposed project area - Image taken within the western portions of the proposed project area. C - Image showing the fairly open fields that have been burnt in recent days. D – large thicket of alien trees – eucalyptus, some places also burned. No rocky out crops and no fossils seen.

Figure 6: A-D – More views of the large thicket of eucalyptus trees with minimal undergrowth so the soil is visible. E-F - View of the large freshly ploughed fields along the northern edge of the proposed project area. No rocks and no rocky outcrops.

Figure 7: A-C - General view of the surrounding environment within the eastern half of the proposed project area. D-E - View of a possible sinkhole near the northern ploughed fields. F - General view of the R501 running along the southern edge of the proposed project area.

6. Impact assessment

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

Following the mitigation sequence/hierarchy of five levels:

a) Avoid/prevent significant impact
b) Minimise
c) Rehabilitate/restore
d) Off-set
e) No-go,

mitigation in the form of removing any important fossils (steps a and b) will reduce realty the impact of this project on the palaeontological heritage.

The key objectives of the risk assessment are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Ranked criteria listed in Table 5a and the scores for the palaeontological impact are given in Table 5b.

Table 5a: Impact Assessment and Scoring according to WSP protocols.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

Table 5b: Impact Assessment score and significance for Palaeontology for the Merafong Solar PV project.

Project: Merafong Solar PV		
Criteria (from table above)	Scores	
	Pre-mitigation	Post-mitigation
Impact Magnitude (M)	2	1
Impact Extent (E)	1	1
Impact Reversibility (R)	5	3
Impact Duration (D)	4	1
Probability of Occurrence (P)	2	2
Significance (M+E+R+D) x P	(2+1+5+2)2 = 20	(1+1+3+1)2 = 12
Significance Rating	Low	Very Low
Negative / Positive	negative	positive

Mitigation

The impact on the palaeontological heritage can be reduced greatly by a palaeontologist conducting a pre-construction site visit to look for fossils and removing any scientifically important fossils with the relevant SAHRA permit.
(See Section 8 and Appendix A).

Positive/Negative Impact
The discovery and removal of fossils as a direct result of this project has a positive impact because prior to the excavations for this project the particular fossils or fossil deposit were unknown to science.

Additional Environmental Impacts
As far as the palaeontology is concerned, there are no additional impacts because the fossils are inert and inactive.

Cumulative Impacts
As far as the palaeontology is concerned, there are no cumulative impacts because each site is unique and may or may not have fossils. Fossil bones may be scattered over the landscape but their distribution is erratic and unpredictable. If a bone-bed or plant outcrop occurs this would be an aerially small concentration of fossils and very unlikely to extend beyond tens of metres. Therefore, projects on adjacent land parcels are unlikely to add any impact on this project. In addition, no fossils were found in the project footprint.

No-Go areas
There are NO no-go areas because the fossils, if present, can be removed and curated in a recognised institution such as a museum or university that has the facilities to store and research the fossil material.

Impact Phase
It is only during the **Construction Phase** that there could be any impact on the palaeontological heritage because this is when the ground will be broken for excavations for foundations and infrastructure. Fossils occur in the ground. The operational and de-commissioning phases will not affect the palaeontology.

7. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and some might contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve fossils. From the site visit observations there were NO FOSSILS on the land surface. It is not known, however, what rocks or possible fossils lie below the surface until excavations have commenced.

8. Recommendation

Based on the site visit, experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying soils of the Quaternary. Outcrops of the same formation in other parts of the country have fossils, therefore, there is a chance that they also occur in this area. The site visit and walk

through in August 2024 (winter and burned vegetation so visibility was very good), however, confirmed that there were NO FOSSILS in the project footprint. There is a chance that plant fossils may occur below the ground surface in the mudstones, siltstones or shales of the Vryheid Formation or trace fossils such as stromatolites and microbialites in the dolomites of the Malmani Subgroup so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once excavations for foundations and infrastructure have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. The impact on the palaeontological heritage would be low pre-mitigation and very low post-mitigation, as far as the palaeontology is concerned, so the project should be authorised. There are no no-go areas, no buffers are required and there will be no cumulative impact.

ASPECT	SCREENING TOOL SENSITIVITY	VERIFIED SENSITIVITY	OUTCOME STATEMENT/ PLAN OF STUDY	RELEVANT SECTION MOTIVATING VERIFICATION
Palaeontology	Very High	Low	Palaeontological Impact Assessment	Section 7.2. SAHRA Requirements

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10. Fossil Chance Find Protocol

Monitoring Programme for Palaeontology – to commence once the excavations / drilling activities begin.

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
2. When excavations begin the rocks and discard must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (trace fossils such as stromatolites or microbialites, plants, insects, bone or coal) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (for example see Figures 8-9). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project,

should visit the site to inspect the selected material and check the dumps where feasible.

6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

11. **Appendix A** – Examples of fossils from the Malmani Subgroup and Vryheid Formation

Figure 8: Photographs of stromatolites (trace fossils) that could be found in the Malmani Subgroup dolomites, to assist the on-site responsible person.

Figure 9: Photographs of fossil plants of the *Glossopteris* flora that could be found in the shales of the Vryheid Formation.