

DESKTOP PALAEOLOGICAL ASSESSMENT

**INDEPENDENT REVIEW OF EXISTING PIA AND ADDENDUM
DOCUMENT/LETTER WITH PALAEOLOGY IMPACT ASSESSMENT**

**THE ENVIRONMENTAL AUTHORISATION AMENDMENT APPLICATION FOR
THE 75 MW HUMANSRUS PHOTOVOLTAIC (PV) 1 SOLAR POWER FACILITY
(REFERRED TO AS LESEDI POWER COMPANY), NORTHERN CAPE**

FOR

EARTHnSKY Environmental

DATE: 02 March 2023

By

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EXECUTIVE SUMMARY

Gideon Groenewald was appointed by EARTHnSKY Environmental to undertake an independent review of existing PIA and to provide an addendum document/letter in regards to the existing palaeontology impact assessment. The addendum document is in support of the environmental authorisation amendment application for the 75 MW Humansrus photovoltaic (PV) 1 solar power facility (referred to as Lesedi Power Company), in the Tsantsabane Local Municipality, Siyanda District Municipality in the Northern Cape Province.

The development falls in a rural setting where the natural ecosystem has, to a lesser degree, been modified by agricultural activities over the years.

This assessment forms part of a review process and upgrading of an existing Environmental Authorization and the aim of the revision document is to provide a professional opinion on the possible impacts of changes in the layout, caused by unforeseen but practical changes in the layout plans during construction. This assessment will provide a clear indication of the palaeontological sensitivity related to the “as-built” scenario.

The geology underlying the development area for the 75 MW Humansrus photovoltaic (PV) 1 solar power facility comprises the Ghaap Group of the Transvaal Supergroup and sand of the Gordonia Formation.

Rocks of the Ghaap Group is world renowned for significant finds of Palaeontological Heritage objects, including highly significant fossils of micro-bacteria called Stromatolites. The dolomites can contain significant deposits of cave breccia with human remains, but these do not underlie the study sites for the solar developments referred to in this review request.

The development areas for the Solar PV systems as well as the corridors for the interconnecting power grids were assessed and all the areas have been mapped.

It is however very important to note that, although a very high sensitivity rating is accolated to areas underlain by Ghaap Group geology, the actual impact per site of excavation might be limited. Although it is imperative to indicate the very high sensitivity on the initial maps, the *modus operandi* of the project palaeontologist, when appointed, must be to train the ECO and team members to adhere to the “Chance Find Protocol” recommendation. Fossils recorded during operations must be curated and moved to the institute indicated by SAHRA.

Recommendations

- The on-site manager must be informed that significant areas are underlain by rocks with a very high sensitivity for palaeontological heritage. The areas not underlain by dolomite will have a moderate sensitivity for palaeontological heritage and no fossils are expected to be found after conclusion of the development.
- The project will require a formal “Chance Find Protocol” (attached to this report) that will have to be upgraded during the implementation phase of the project.
- **NOTE: It is the professional opinion of Dr Gideon Groenewald, accredited palaeontologist, that NO FURTHER mitigation is needed for Palaeontological Heritage at this site and that the operational activities of this project, as presently defined, will have no negative impact on Palaeontological Heritage, as long the recommendations of the Chance Find Protocol (attached) is adhered to.**
- Recommendations for palaeontological monitoring and mitigation will have to be incorporated into the EMP for approval by the SAHRA.

TABLE OF CONTENT

EXECUTIVE SUMMARY.....	2
Recommendations	3
TABLE OF CONTENT.....	4
INTRODUCTION.....	6
Existing Palaeontological Impact Assessment (PIA)	8
Revised information	9
Legal Requirements	10
Aims and Methodology.....	10
Scope and Limitations of the Desktop Study.....	13
Locality and Proposed Development.....	14
GEOLOGY	15
Transvaal Supergroup	15
Ghaap Group.....	15
Gordonia Formation	16
PALAEONTOLOGY	16
CONCLUSIONS.....	17
Recommendations	18
REFERENCES.....	19
QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR.....	21
DECLARATION OF INDEPENDENCE	21
CHANCE FIND PROTOCOL FOR PALAEONTOLOGICAL HERITAGE.....	22
Mitigation Measures Normally Encountered.....	23
Functional responsibilities of the Developer	23
Documentary record of palaeontological occurrences	24
Functional responsibilities of the appointed Palaeontologist.....	24
Exposure of palaeontological material.....	25
CONCLUSION	25

TABLE OF FIGURES

Figure 1 Geology of the study area (historic geological map). Ghaap Plato Lime Acres Member (Vgl) with limestone. Quaternary aged colluvial deposits and sand (Qs). Following revised mapping the area is underlain by dolomite of the Danielskuil Formation, lava of the Ongeluk Formation, diamictite of the Makganyene Formation, and windblown sand of the Gordonia Formation	15
Figure 2 Very high palaeontological sensitivity is associated with dolomite of the Danielskuil Formation that underlies only the northern part of the study area.....	17

LIST OF TABLES

Table 1 Palaeontological sensitivity analysis outcome classification 11

INTRODUCTION

Gideon Groenewald was appointed by EARTHnSKY Environmental to undertake an independent review of existing PIA and to provide an addendum document/letter in regards to the existing palaeontology impact assessment. The addendum document is in support of the environmental authorisation amendment application for the 75 MW Humansrus photovoltaic (PV) 1 solar power facility (referred to as Lesedi Power Company), in the Tsantsabane Local Municipality, Siyanda District Municipality in the Northern Cape Province.

The development falls in a rural setting where the natural ecosystem has, to a lesser degree, been modified by agricultural activities over the years and the existing Lesedi Solar Power Facility is located 4 km southeast of the Groenwater settlement and 30 km east of Postmasburg in the Northern Cape. Construction of the Lesedi Solar Power Facility commenced in November 2012, within the EA validity period (August 2011 to August 2014) and is currently operational. Full operations of the Lesedi Solar Power Facility commenced on 21 May 2014 and the facility is expected to have an operational lifespan of around 25 years.

The Lesedi Solar Power Facility comprises of the following components and infrastructure:

- A facility that generates up to 75 MW direct current (DC) of electricity which is fed into the national power grid; and
- Key infrastructure components which include *inter alia* the following: - Lesedi North and South solar fields with fixed Photovoltaic (PV) arrays with an output of 64MW_{AC};
- Electrical connections;
- Substation, capacitor banks, grid connection and associated infrastructure;
- Access roads and site access; and
- Additional infrastructure (O&M buildings, waste, water, sewage and stormwater infrastructure etc).

The Applicant, Oakleaf Investment Holdings, is applying for the following amendments to EA (12/12/20/1903/1, dated 23 February 2012) issued for the 75 MW Humansrus Photovoltaic (PV) 1 Solar Power Facility as follows:

1. Confirmation of the change of the contact person for Oakleaf Investment Holdings 79 (Pty) Ltd. (Trading as Lesedi Power Company (Pty) Ltd).;
2. To amend the size and location of the substation, and indicate that the substation area comprises a control room, external 132kV transformers, electric switchgear, capacitor banks and is fenced for security and safety;
3. To indicate the location of the Operations and Maintenance (O&M) buildings, and to show this consists of an office and storage buildings, security, ablution facilities, parking, outdoor storage area and water treatment facility.

4. To include the aboveground 22kV powerlines between northern solar field and substation – across railway line and D3381 road;
5. Relaxation of the 200m visual buffer for the aboveground 22kV powerlines;
6. To show the PV arrays of up to 1km in length across the south solar field and up to 1,5km in length across the north solar field, made up of approximately 100m sections;
7. To accommodate the temporary storage of up to 300 waste solar PV modules on site, in compliance with the 2013 Norms and Standards for the Storage of Waste (NEM:WA 59 of 2008);
8. To align the authorised development footprint with the farm boundary, to accommodate the overburden storage area, and to indicate that a small borrow pit on site was not needed during the construction phase, as excess overburden was used for filling;
9. To indicate that the solar irradiation measuring panel was in place during the feasibility stage, to collect data on the solar resource which information the layout of the facility, but is not permanent, and was removed prior to the commencement of operations;
10. To include three autonomous weather stations (AWS), approx. 4m in height for the continuous monitoring of local conditions during the operational phased, and three soiling stations, measuring approx. 4m² in size each, to monitor and determine operational efficiencies; and
11. Approval of the as-built drawings and layout plans for the entire operation.

This assessment forms part of a review process and upgrading of an existing Environmental Authorization and the aim of the revision document is to provide a professional opinion on the possible impacts of changes in the layout, caused by unforeseen but practical changes in the layout plans during construction. This assessment will provide a clear indication of the palaeontological sensitivity related to the “as-built” scenario.

The aims of this independent assessment of the Palaeontological Heritage is to:

- a. *Review of findings and impact assessment of the initial Paleontological Assessment undertaken as part of the original NEMA EIA application and EA issued;*
- b. *Determine and assess the possible impacts of significance (if any), specifically in relation to the various amendments to be applied for (particularly to the localities of specific infrastructures, property boundary etc.); and*
- c. *Review and comment on mitigation and management measures (if any) for inclusion into the existing Operational Environmental Management Programme (OEMPr).*

Modus operandi

- Review documentation of existing PIA

- Review reality of the palaeontology of the site to determine reasoning for existing recommendations
- Review changes to the “as built” layout and note the new placing of infrastructure
- Letter or report with recommendations and indication of any significant changes in the impact assessment as reported – GIS mapping of palaeontological sensitivity - **main deliverable**
- Inclusion of a “Chance Find Protocol” (CFP) document to assist the EAP and the ECO with operational management issues regarding possible impact on palaeontological heritage – **secondary deliverable**

The reader of this report is referred to existing documentation related to an existing Environmental Authorisation. The basic database for the project still holds.

Existing Palaeontological Impact Assessment (PIA)

The database for the existing PIA was assessed and it is concluded that the database is still valid and that the following summary still holds for this study area:

“DISTURBANCE OR DAMAGE TO PALAEOLOGY” 11.4.1 Impact Description and Assessment

Construction Phase Impact

Impacts on palaeontological resources in the area will be confined to levelling and excavations for roads and foundations. If fossiliferous deposits are present, and if the recommended remediation is carried out, then this will represent a positive impact. Palaeontology benefits from excavation for roads and construction if this is carried out with the necessary collaboration and cooperation.

All planned development is southwest of the low hills to the northeast of the Study Area. These low hills appear as dark fingers of Daniëlskuil Formation ironstones on the aerial photograph. Any possible excavations into this formation in the Study Area, for foundations or road metal, will result a negligible impact on any potential palaeontology. This anyway would be restricted to the possible recovery of microfossils, which requires small samples collectable from numerous extant outcrops.

The palaeontological potential and possible impact for the Daniëlskuil Formation are considered to be **negligible**. The diamictites and conglomerates of the Makganyene Formation have more limited outcrop, but apart from possible stromatolites in dolomite and microfossils in chert layers, these predominantly glacial sediments are not expected to be fossiliferous. Any sampling for possible microfossils would be driven by external research interests and not rescue. The mapped outcrop of the Makganyene Formation

falls outside the area with planned infrastructure, and hence the palaeontological impact is considered to be **negligible**. The Ongeluk volcanics are exposed not only in the jasper mine, but also as flat carapaces and scree on the slopes around the abandoned southern Humansrus farmstead. These volcanic rocks are not fossiliferous.

The palaeontological potential is **negligible**. The sandy valley fills of the Gordonia Formation of the Kalahari Group may contain Cenozoic terrestrial molluscan (snail) and mammalian fossils. It is not possible to predict if they are present, or if present, whether excavation will be deep enough to encounter them. A shallow seasonal watercourse crosses the central low-lying area of the farm. In various places subsurface gravel is exposed in a series of very shallow gullies and in one place in a dam excavation. Although these exposures contain scatters of stone artefacts, no fossil material was found in any of these exposures. The area around the water point was visited, as it was thought it may represent a former natural spring. There was no evidence of spring deposits, and the farmer indicated it was fed by a borehole. The palaeontological potential and possible impact for the valley fill sediments are considered to be **low to negligible.**” (Existing PIA documentation).

Revised information

The application for amendment of the existing EA include the following amendment in terms of the name of the client as well as the final specifications of the project:

Client name: **Oakleaf Investment Holdings 79 (RF) (Pty) Ltd.**

Site name: **75 MW Humansrus Photovoltaic (PV) 1 Solar Power Facility (referred to as Lesedi Power Company)**

Property description: **Remainder of Farm No. 469, Hay RD**

Project title: **Environmental Authorisation amendment application for the 75 MW Humansrus Photovoltaic (PV) 1 Solar Power Facility (referred to as Lesedi Power Company)**

This desktop palaeontological impact assessment is therefore a general assessment of the entire proposed area and, due to the fact that all the sites applicable for review falls within a moderately sensitive geological environment, the report does not aim to address specific sites.

From a preliminary assessment and following recommendations on the SAHRIS sensitivity map for Palaeontology, the farm is underlain by moderate and very highly sensitive geological formations – hence the need for this desktop assessment.

Legal Requirements

This palaeontological assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999 (revised 2017) as well as the requirements of Ngwao-Boswa Jwa Kapa Bokone, the Provincial Heritage Resources Authority of the Northern Cape Province (rtimothy@nbkb.org.za). In accordance with Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens; and
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

Aims and Methodology

A desktop investigation is often the only opportunity to record the fossil heritage within the development footprint. These records are very important to understand the past and form an important part of South Africa's National Estate.

Following the "*SAHRA APM Guidelines: Minimum Standards for the Archaeological & Palaeontological Components of Impact Assessment Reports*" the aims of the palaeontological impact assessment are:

- to identify exposed and subsurface rock formations that are considered to be palaeontologically significant;
- to assess the level of palaeontological significance of these formations;
- to comment on the impact of the development on these exposed and/or potential fossil resources and
- to make recommendations as to how the developer should conserve or mitigate damage to these resources.

Prior to a field investigation, a preliminary assessment (desktop study) of the topography and geology of the study area is made, using appropriate 1:250 000 geological information (3024 Colesberg) in conjunction with Google Earth. Potential fossiliferous rock units (groups, formations etc.) are identified within the study area and the known fossil heritage within each rock unit is inventoried from the published scientific

literature, previous palaeontological impact studies in the same region and the author's field experience.

Priority palaeontological areas are identified within the development footprint to focus the field investigator's time and resources. The aim of the desktop survey is to document any exposed fossil material and to assess the palaeontological potential of the region in terms of the type and extent of rock outcrop in the area.

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the minimal extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 below.

Table 1 Palaeontological sensitivity analysis outcome classification

PALAEONTOLOGICAL SIGNIFICANCE/VULNERABILITY OF ROCK UNITS	
The following colour scheme is proposed for the indication of palaeontological sensitivity classes. This classification of sensitivity is adapted from that of Almond et al (2008) and Groenewald et al., (2014)	
RED	Very High Palaeontological sensitivity/vulnerability. Development will most likely have a very significant impact on the Palaeontological Heritage of the region. Very high possibility that significant fossil assemblages will be present in all outcrops of the unit. Appointment of professional palaeontologist, desktop survey, phase I Palaeontological Impact Assessment (PIA) (field survey and recording of fossils) and phase II PIA (rescue of fossils during construction) as well as application for collection and destruction permit compulsory.
ORANGE	High Palaeontological sensitivity/vulnerability. High possibility that significant fossil assemblages will be present in most of the outcrop areas of the unit. Fossils most likely to occur in associated sediments or underlying units, for example in the areas underlain by Transvaal Supergroup dolomite where Cenozoic cave deposits are likely to occur. Appointment of professional palaeontologist, desktop survey and phase I Palaeontological Impact Assessment (field survey and collection of fossils) compulsory. Early application for collection permit recommended. Highly likely that a Phase II PIA will be applicable during the construction phase of projects.

GREEN	<p>Moderate Palaeontological sensitivity/vulnerability. High possibility that fossils will be present in the outcrop areas of the unit or in associated sediments that underlie the unit. For example areas underlain by the Gordonia Formation or undifferentiated soils and alluvium. Fossils described in the literature are visible with the naked eye and development can have a significant impact on the Palaeontological Heritage of the area. Recording of fossils will contribute significantly to the present knowledge of the development of life in the geological record of the region. Appointment of a professional palaeontologist, desktop survey and phase I PIA (ground proofing of desktop survey) compulsory.</p>
BLUE	<p>Low Palaeontological sensitivity/vulnerability. Low possibility that fossils that are described in the literature will be visible to the naked eye or be recognized as fossils by untrained persons. Fossils of for example small domal Stromatolites as well as micro-bacteria are associated with these rock units. Fossils of micro-bacteria are extremely important for our understanding of the development of Life, but are only visible under large magnification. Recording of the fossils will contribute significantly to the present knowledge and understanding of the development of Life in the region. Where geological units are allocated a blue colour of significance, and the geological unit is surrounded by highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a blue colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. Collection of a representative sample of potential fossiliferous material recommended. At least a Desktop Survey and “Chance Find Protocol” is compulsory. The Chance Find Protocol must be included in the EMP for the project.</p>

GREY	<p>Very Low Palaeontological sensitivity/vulnerability. Very low possibility that significant fossils will be present in the bedrock of these geological units. The rock units are associated with intrusive igneous activities and no life would have been possible during emplacement of the rocks. It is however essential to note that the geological units mapped out on the geological maps are invariably overlain by Cenozoic aged sediments that might contain significant fossil assemblages and archaeological material. Examples of significant finds occur in areas underlain by granite, just to the west of Hoedspruit in the Limpopo Province, where significant assemblages of fossils and clay-pot fragments are associated with large termite mounds. Where geological units are allocated a grey colour of significance, and the geological unit is surrounded by very high and highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a grey colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. It is important that the report should also refer to archaeological reports and possible descriptions of palaeontological finds in Cenozoic aged surface deposits. At least a Desktop Survey and "Chance Find Protocol" document is compulsory. The Chance Find Protocol must be included in the EMP of the project.</p>
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When rock units of Moderate to Very High Palaeontological sensitivity are present within the development footprint, palaeontological mitigation measures must be incorporated into the Environmental Management Plan. A suitably qualified Palaeontologist must clear all projects falling on Low to Very Low Palaeontological sensitive geology.

Scope and Limitations of the Desktop Study

The study will include: i) an analysis of the area's stratigraphy, age and depositional setting of fossil-bearing units; ii) a review of all relevant palaeontological

and geological literature, including geological maps, and previous palaeontological impact reports; iii) data on the proposed development provided by the developer (e.g. location of footprint, depth and volume of bedrock excavation envisaged) and iv) where feasible, location and examination of any fossil collections from the study area (e.g. museums).

The key assumption for this scoping study is that the existing geological maps and datasets used to assess site sensitivity are correct and reliable. However, the geological maps used were not intended for fine scale planning work and are largely based on aerial photographs alone, without ground-truthing. There is also an inadequate database for fossil heritage for much of the RSA, due to the small number of professional palaeontologists carrying out fieldwork in RSA and the Kingdom of Lesotho. Most development study areas have never been surveyed by a palaeontologist.

These factors may have a major influence on the assessment of the fossil heritage significance of a given development and without supporting field assessments may lead to either:

- an underestimation of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or
- an overestimation of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by weathering, or are buried beneath a thick mantle of unfossiliferous “drift” (soil, alluvium etc.).

Locality and Proposed Development

The project comprises the development of Solar PV Facilities close to Danielskuil in the Northern Cape. The development falls south-west of Danielskuil in the Tsantsabane Local Municipality, Siyanda District Municipality in the Northern Cape Province.

The sites of the development vary from extensive savanna plains with deep sandy to loamy soils resulting from weathering of the underlying geology to highly variable geomorphological setting associated with metamorphic and volcanic rocks in the hills, with resistant quartzite and lava layers, interbedded with dolomite.

It is important to note that the developments vary from single unit or specific point sites, to linear road making as well as larger areal developments of solar panel coverage.

This desktop survey aims to provide the decision making authority with an amended, general summary of the geology and palaeontology of the development site.

GEOLOGY

The development site is underlain by sets of highly significant geological units that vary in age from Vaalian to Quaternary aged rock units with evidence of very early life, stromatolites, in the older rocks and much younger life in the younger rocks.

The entire study area is underlain by historic units of the Lime Acres Member, Ghaap Plato Formation of the Campbell Group, Griekwaland West Supergroup (Figure 1). Recent revision of the geological maps resulted in a new set of stratigraphic units. The new terminology is used in all reporting documents, including this revised document.

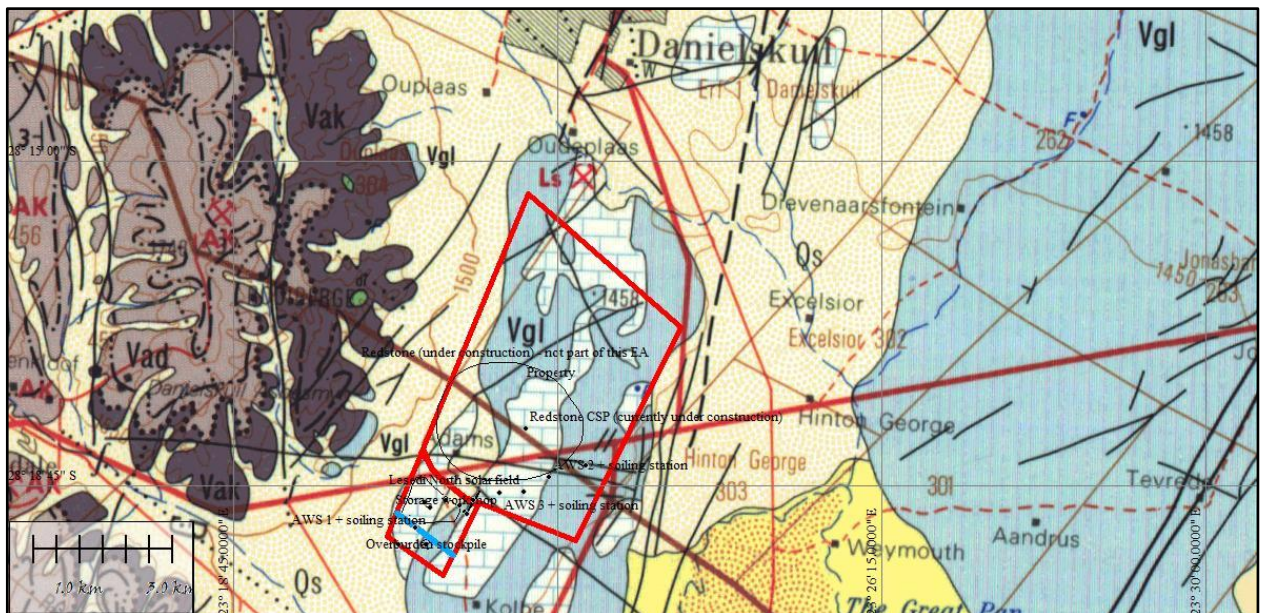


Figure 1 Geology of the study area (historic geological map). Ghaap Plato Lime Acres Member (Vgl) with limestone. Quaternary aged colluvial deposits and sand (Qs). Following revised mapping the area is underlain by dolomite of the Danielskuil Formation, lava of the Ongeluk Formation, diamictite of the Makganyene Formation, and windblown sand of the Gordonia Formation

Transvaal Supergroup

Ghaap Group

The study area is underlain by Vaalian aged dolomite and limestone of the Danielskuil Formation, lava of the Ongeluk Formation, diamictite of the Makganyane Formation.

Gordonia Formation

The Gordonia Formation comprises a recent to Quaternary aged windblown sand deposit that covers very large stretches of land in the North-Western parts of the Kalahari.

PALAEONTOLOGY

The palaeontological heritage of the Transvaal Supergroup and specifically the Danielskuil Formation forms part of the extremely highly rated treasures of the South African Pre-Cambrian history. Following years of investigations, the latest consensus is that the lithological unit contains significant information in terms of ancient seawater temperatures and chemical composition (MacRae, 1999). Areas underlain by dolomite can also contain cave breccias with significant remains of Homonid, but in this case these rocks do not underlie the specific areas developed for the solar installations. The palaeontological finds in the Gordonia Formation varies from less abundant vertebrate remains to more abundant pseudo-fossils of root structures and rhizomes. It therefore leads to our conclusion that the palaeontological sensitivity of the study area (project property) must be regarded as of global significance, as indicated in the Palaeontological Impact Assessment under revision in this report. The impact rating will be **very high negative** if no mitigation is proposed, whereas mitigation (collecting and recording of significant fossils) will contribute significantly towards our understanding of the Vaalian aged as well as Quaternary ages events, resulting a **very high positive impact** rating.

Following a detailed desktop survey of existing data, we confirm the fact that only areas in the north and east of the study area are underlain by very highly sensitive (red colour) geological formations (Figure 2). Areas underlain by deep soil cover (colluvial plains) are indicated as moderately sensitive (green colour) since deep excavation (>1,5m) can expose significant fossils.

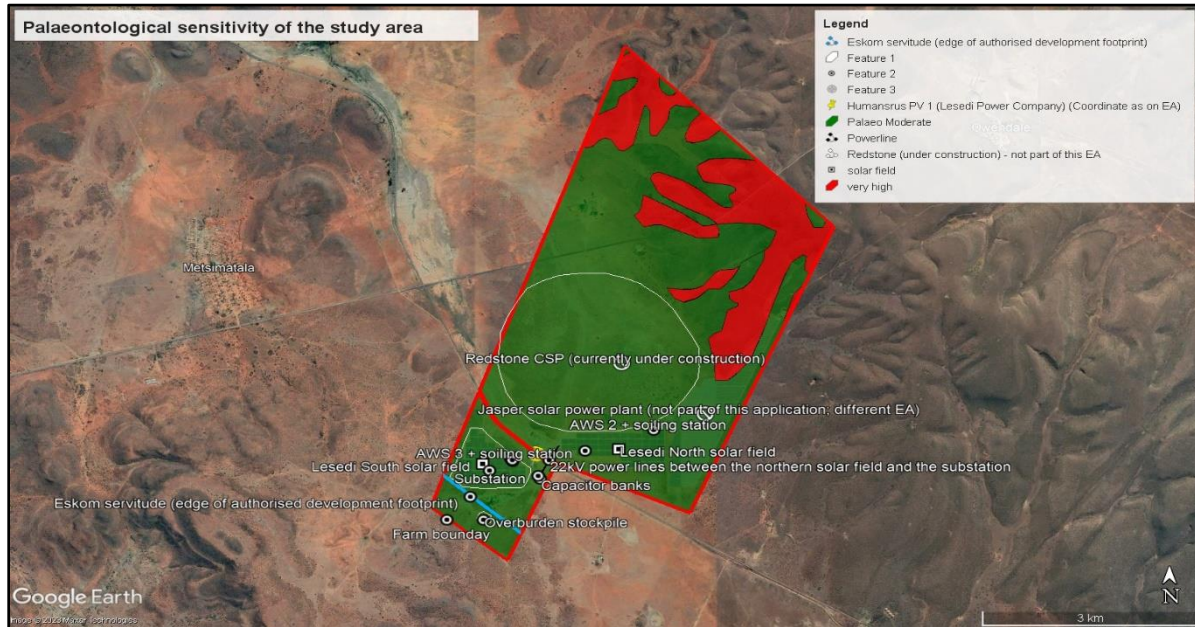


Figure 2 Very high palaeontological sensitivity is associated with dolomite of the Danielskuil Formation that underlies only the northern part of the study area

The remainder of the study area is underlain by volcanic rocks, and units of Vaalian aged deposits with only moderate sensitivity for palaeontological heritage. There is, in our professional opinion, no reason to differ from the initial conclusions of the consultants who recommended limited precaution for palaeontological heritage.

Areas in the study area underlain by sand of the Gordonia Formation are also regarded as having a medium sensitivity for Palaeontological Heritage. The conclusions reached by the consultants during the first assessments are therefore regarded as still valid for this amendment report.

CONCLUSIONS

The geology underlying the development area for the 75 MW Humansrus photovoltaic (PV) 1 solar power facility comprises the Ghaap Group of the Transvaal Supergroup and sand of the Gordonia Formation.

Rocks of the Ghaap Group is world renowned for significant finds of Palaeontological Heritage objects, including highly significant fossils of micro-bacteria called Stromatolites. The dolomites can contain significant deposits of cave breccia with human remains, but these do not underlie the study sites for the solar developments referred to in this review request.

The development areas for the WEF/Solar PV systems as well as the corridors for the interconnecting power grids were assessed and all the areas have been mapped.

It is however very important to note that, although a very high sensitivity rating is accolated to areas underlain by Ghaap Group geology, the actual impact per site of excavation might be limited. Although it is imperative to indicate the very high sensitivity on the initial maps, the *modus operandi* of the project palaeontologist, when appointed, must be to train the ECO and team members to adhere to the “Chance Find Protocol” recommendation. Fossils recorded during the operational phase must be curated and moved to the institute indicated by SAHRA.

Recommendations

- The on-site manager must be informed that significant areas are underlain by rocks with a very high sensitivity for palaeontological heritage. The areas not underlain by dolomite will have a moderate sensitivity for palaeontological heritage and no fossils are expected to be found after conclusion of the development.
- The project will require a formal “Chance Find Protocol” (attached to this report) that will have to be adhered to during the implementation (operational) phase of the project.
- **NOTE: It is the professional opinion of Dr Gideon Groenewald, accredited palaeontologist, that NO FURTHER mitigation is needed for Palaeontological Heritage at this site and that the operational activities of this project, as presently defined, will have no negative impact on Palaeontological Heritage, as long the recommendations of the Chance Find Protocol (attached) is adhered to.**
- Recommendations for palaeontological monitoring and mitigation will have to be incorporated into the EMPr for approval by the SAHRA.

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QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technicon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeo-ecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

DECLARATION OF INDEPENDENCE

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.



Dr Gideon Groenewald
Geologist

CHANCE FIND PROTOCOL FOR PALAEOLOGICAL HERITAGE

Humansrus photovoltaic (PV) 1 solar power facility (referred to as Lesedi Power Company), in the Tsantsabane Local Municipality, Siyanda District Municipality in the Northern Cape Province

Mitigation for excavation Impact on Palaeontological Heritage Resources Humansrus photovoltaic (PV) 1 solar power facility

It is essential that the appointed palaeontologist, in consultation with the Project Environmental Manager and the contractors and ECO's of further excavation works during the implementation phase of the project (if any excavation work is required during the operational phase), develop a short-term strategy for the recovery of significant fossils during the excavation operation. As part of such a strategy, the discussions with the palaeontologist must include:

- Initially, and at least for the *duration of excavations*, visit the site on request of the ECO of the specific construction site, to ensure recording of all potentially significant fossil strata. Due to the longevity of this contractual involvement it is not possible to have pre-determined timing on further visits and it is a conclusion from present observations, that more frequent visits by the Palaeontologist during excavations into the Ghaap Group sediments will **definitely** be required.
- Determine a short-term strategy and budget for the recording of significant fossils (only if very deep (>2m) excavations into bedrock is still planned). This Strategy is simply an oral agreement on when the site is to be inspected and what the finds are that might be recorded. The site visit must include an introduction session with all the managers of the Project Team, including training of the ECO and site managers by the appointed palaeontologist, to basically train people to know what to look out for in terms of fossil heritage on site. This action will be required at the start of each individual excavation activity for the duration of excavations in the "greenfield sections" of the site.
- **Following the Desktop Survey, site visits (Phase 1 PIA) are recommended for areas where excavation into bedrock might expose highly significant fossils.**
- In the case of reporting of any unusual sedimentary structures, the Palaeontologist must be notified, and a site visit must be arranged at the earliest possible time with the Palaeontologist. In the case of the site ECO or the Site Manager becoming aware of suspicious looking material that might be a "Significant Find", the construction must be halted in that specific area and the PEM (Project Environmental Manager) must be informed who will inform the Project Engineer. The Palaeontologist must be given enough time to reach the site and the PEM will

request a Site Instruction from the Engineer to allow for removal the material before excavation continues.

Mitigation Measures Normally Encountered

1. Mitigation of palaeontological material must begin as soon as possible and preferably when “trial excavation” takes place. The appointed specialists must acquaint themselves with the operation and determine feasible mitigation strategies.
2. A plan for systematic sampling, recording, preliminary sorting and storage of palaeontological and sedimentological samples will be developed during the early stages of the project, in collaboration with the Evolutionary Studies Institute (ESI) at WITS University, which is the closest Institute to the site.
3. Mitigation will involve an attempt to capture all rare fossils and systematic collection of all fossils discovered. This will take place in conjunction with descriptive, diagrammatic and photographic recording of exposures, also involving sediment samples and samples of both representative and unusual sedimentary or biogenic features. The fossils and contextual samples will be processed (sorted, sub-sampled, labelled, boxed) and documentation consolidated, to create an archive collection from the excavated sites for future researchers.

Functional responsibilities of the Developer

1. Ensuring, at their cost, that a representative archive of palaeontological samples and other records is assembled to characterise the palaeontological occurrences affected by the excavation operation.
2. Provide field aid, if necessary, in the supply of materials, labour and machinery to excavate, load and transport sampled material from the excavation areas to the sorting areas, removal of overburden if necessary, and the return of discarded material to the disposal areas. In the case of this project it is foreseen that invertebrate and trace fossils will be present. *(If more fossils of Permian age are exposed, it will be Very Highly significant and the Palaeontologist will obviously be in close communication with the site ECO and the PEM to act as required by HWC/SAHRA without causing undue standing time for the contractors).*
3. “Facilitate” systematic recording of the stratigraphic and palaeo-environmental features of exposures in the fossil-bearing excavations, by allowing time to describe and measure geological sections, and by providing aid in the surveying of positions where significant fossils are found. *(In the case of this specific development, the likelihood of such finds is very high).*
4. Provide safe storage for fossil material found routinely during excavation operations by construction personnel. In this context, isolated fossil finds in disturbed material qualify as “normal” fossil finds.

5. Provide covered, dry storage for samples and facilities that is defined as a work area for sorting, labelling and boxing/bagging of samples.
6. Costs of basic curation and storage in the sample archive at the ESI, WITS University (labels, boxes, shelving and, if necessary, specifically-tasked temporary employees).

Documentary record of palaeontological occurrences

1. The contractors will, after consultation with the PEM and in collaboration with the Palaeontologist, make the excavation plan available to the appointed specialist, in which the following information are indicated on the plan in the site office at the excavation site. This must be done in conjunction with the appointed specialist and form part of the on-going revision of the “Chance Find Protocol” (CFP) during the excavation stage of the project:

1.1. Initially, all known specific palaeontological information will be indicated on the plan. This will be updated throughout the excavation period.

1.2 Locations of samples and measured sections are to be pegged, and routinely accurately surveyed. Sample locations, measured sections, etc., must be recorded three-dimensionally if any significant fossils are recorded during the time of excavation. This information must be recorded during the first site visit and a clearance from the Palaeontologist (e-mail message will suffice) must be followed up with subsequent e-mail communications with the Site Specific ECO, Site Manager and the PEM.

Functional responsibilities of the appointed Palaeontologist

1. Apply for a permit to collect fossils during the lifetime of the Project and establishment of a representative collection of fossils and a contextual archive of appropriately documented and sampled palaeoenvironmental and sedimentological geodata in collaboration with the ESI at WITS University, or the Rhodes University, depending on the Expertise available at each Institute.

2. Undertake an initial evaluation of potentially affected areas and of available exposures in excavations. A short training session, inclusive of the PEM, Project Managers and the ECO's or their representatives, was presented during the second site visit to this project.

3. On the basis of the above, and evaluation during the early stages of excavation development, in collaboration with the PEM and the contractor management team, more detailed practical strategies to deal with the fossils encountered routinely during excavation, as well as the strategies for major finds must briefly be agreed on.

4. Informal on-site training in responses applicable to “normal” fossil finds must be provided for the PEM, ECO and environmental staff by the appointed specialist. This step is will only be arranged following the discovery of significant fossils at the time of the Phase 2 site visits.

5. Respond to significant finds and undertake appropriate mitigation.

6. During the operational phase, if the PEM or the appropriate ECO indicates significant “strange looking rocks” that might be similar to the fossils indicated to the staff during the information sessions, visit at least once in twelve weeks to “touch base” with the monitoring progress. Document interim “normal” finds and undertake an inspection and documentation of new excavation faces. A strategy for further visits during the life of the excavation must be discussed.
7. Transport of material from the site to the ESI, WITS University or the allocated Institute where an expert on the specific fossils discovered, is presently employed.
8. Reporting on the significance of discoveries, as far as can be preliminarily ascertained. This report is in the public domain and copies of the report must be deposited at ESI, and the South African Heritage Resources Authority (SAHRA). It must fulfil the reporting standards and data requirements of these bodies.
9. Reasonable participation in publicity and public involvement associated with palaeontological discoveries.

Exposure of palaeontological material

1. In the event of construction exposing new palaeontological material, not regarded as normative/routine as outlined in the initial investigation, such as a major fossil find, the following procedure must be adhered to:

1.1 The appointed specialist or alternates (SAHRA; ESI WITS University; Rhodes University) must be notified by the responsible officer (e.g. the PEM, Chief Engineer, ECO or Contractor Manager), of major or unusual discoveries during excavation, found by the Contractor Staff.

1.2 Should a major *in situ* occurrence be exposed, excavation will immediately cease in that area so that the discovery is not disturbed or altered in any way until the appointed specialist or scientists from the ESI at WITS University, or its designated representatives, have had reasonable opportunity to investigate the find. Such work will be at the expense of the Developer.

Significant fossil finds are known from this area and the appointed palaeontologist must clear continued excavation on the proviso that any suspicious material will be indicated by the ECO to the Palaeontologist via emailed photographic information.

CONCLUSION

The development site for the Humansrus photovoltaic (PV) 1 solar power facility development near Danielskuil in the Tsantsabane Local Municipality, Siyanda District Municipality in the Northern Cape Province, falls on very highly significant sedimentary rocks (Danielskuil Formation) that contain significant fossils. Fossils are known from the area and arrangements must be made to obtain necessary permits for collecting of the fossils that might be exposed during the lifetime of the project.

Well preserved fossils are known from the rocks on site. Following the desktop survey the conclusion is that the potential for finding significant invertebrate and trace-fossils, in any excavation into sediments of the Transvaal Supergroup is **very high**. The cooperation of the entire team of engineers and contractors, is of critical importance. The interest and cooperation of the management team will be highly appreciated and it is essential that any excavations (if required for maintenance or operational activities) be monitored during the entire period of excavation and that this “Chance Find Protocol” be updated on a regular basis during the life-time of the excavation period for the Project. It is essential that the Palaeontologist be notified of the final sign-off of the project date, for final posting of the “Chance Find Protocol” on the SAHRIS Website for record purposes.

It is recommended that:

- The Project Managers must be informed of the fact that a very high Palaeontological Sensitivity was allocated to the very northern part of the development and due to the covered nature of the material, significant fossils are only expected during further excavations on site if excavations are deeper than 2m into un-weathered bedrock of dolomites in the Danielskuil Formation.
- This “Chance Find Protocol” must be included in the EMPr of the Project and a reasonable budget must be allocated to ensure compliance with the legal responsibility of the developer in terms of the proper conservation of and storage of Palaeontological Heritage.
- The SAHRA must be informed of the content of this “Chance Find Protocol” and EMPr arrangements by the PEM and the Developer, for final conclusion of the Project.
- **Following the desktop survey, it is the professional opinion of Dr Gideon Groenewald, accredited palaeontologist, that no further mitigation for Palaeontological Heritage is required, specifically where the present project area is underlain by moderately sensitive rock units.**