



**PROPOSED ESTABLISHMENT OF FOUR ADDITIONAL 132kV
POWER LINES AT THE ESKOM WATERSHED SUBSTATION,
LICHTENBURG, DITSOBOTLA LOCAL MUNICIPALITY, NGAKA
MODIRI MOLEMA DISTRICT MUNICIPALITY, NORTH-WEST
PROVINCE**

Heritage Impact Report

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Client: Environmental Impact Management Services (Pty) Ltd (EIMS)

Declaration of Independence

This report has been compiled by PGS Heritage, an appointed Heritage Specialist for Environmental Impact Management Services (Pty) Ltd (EIMS). The views stipulated in this report are purely objective and no other interests are displayed during the decision making processes discussed in the Heritage Impact Assessment.

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Report Title	<i>The proposed development of four additional 132kV power lines at the Eskom Watershed Substation, Lichtenburg, Ditsobotla Local Municipality in the Ngaka Modiri Molema District Municipality, North-West Province – Heritage Impact Assessment</i>		
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EXECUTIVE SUMMARY

PGS Heritage (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd (EIMS) to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Assessment Report (BAR) for four additional 132kV power lines at the Eskom Watershed substation, Lichtenburg, Ditsobotla Local Municipality in the Ngaka Modiri Molema District Municipality, North-West Province.

During the heritage study no heritage sites of significance were identified in the study area footprint. However, the desktop Palaeontological Impact Assessment study identified the existence of geology that is likely to contain fossiliferous material that could be impacted by the proposed development.

Specific management and mitigation measures with regards to possible palaeontological finds that could be made during construction activities are:

Palaeontology

The study area is underlain by Vaalian aged Chert-rich Dolomites of the Monte Christo Formation, Malmani Subgroup, Chuniespoort Group, Transvaal Sequence. The Monte Christo Formation begins with an erosive breccia and continues with stromatolitic and oolitic platformal dolomites.

Stromatolites are recorded from the dolomite layers. Highly fossiliferous Caenozoic cave breccias are also known to occur within the dolomite layers, but are not mapped individually. These fossiliferous deposits often contain more recent mammal and hominid fossils e.g. in the Cradle of Humankind.

Recommendation:

The developer and the ECO of the project must be informed of the fact that stromatolites have been recorded from the Monte Christo Formation and it is also possible that Caenozoic cave deposits may be present. If fossils are observed a trained palaeontologist must be appointed to collect the fossils according to SAHRA specifications.

Cultural landscape

The establishment of the proposed four additional power lines will not have a negative influence on the cultural landscape or characteristics of the area in the long term. Short term impacts will only be during construction and will be for the duration of the construction timeframe. Screening of construction activities as per usual construction requirements is recommended.

General

Further to these recommendations, the general Heritage Management Guidelines in Section 7 need to be incorporated into the EMP for the project.

The overall impact of the development on heritage resources is seen as acceptably low and impacts can be mitigated to acceptable levels.

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1 INTRODUCTION

PGS Heritage (PGS) was appointed by Impact Management Services (Pty) Ltd (EIMS) to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Assessment Report (BAR) for the four additional 132kV power lines at the Eskom Watershed substation, Lichtenburg, Ditsobotla Local Municipality in the Ngaka Modiri Molema District Municipality, North-West Province.

1.1 Scope of the Study

The aim of the study is to identify possible heritage sites and finds that may occur in the proposed development area. The Heritage Impact Assessment aims to inform the BAR in the development of a comprehensive EMP to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This Heritage Impact Report was compiled by PGS Heritage (PGS).

The staff at PGS has a combined experience of nearly 70 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where the staff has the relevant expertise and experience to undertake that work competently.

Jennifer Kitto, Project Manager and Heritage Specialist for this project, has 15 years' experience in the heritage sector, a large part of which involved working for a government department responsible for administering the National Heritage Resources Act, No 25 of 1999. She is therefore well-versed in the legislative requirements of heritage management. She holds a BA in Archaeology and Social Anthropology and a BA (Hons) in Social Anthropology.

Dr Gideon Groenewald holds a PhD in Geology from the Nelson Mandela Metropolitan University (1996) and the National Diploma in Nature Conservation from the University of South Africa (1990). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeoecological 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).

1.3 Assumptions and Limitations

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites as well as dense vegetation. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.

Such observed or located heritage features and/or objects may not be disturbed or removed in any way, until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

1.4 Legislative Context

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

- i. National Environmental Management Act (NEMA), Act 107 of 1998
- ii. National Heritage Resources Act (NHRA), Act 25 of 1999
- iii. Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002
- iv. Development Facilitation Act (DFA), Act 67 of 1995

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

- i. National Environmental Management Act (NEMA) Act 107 of 1998
 - a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)

- b. Environmental Scoping Report (ESR) – Section (29)(1)(d)
 - c. Environmental Impact Assessment (EIA) – Section (32)(2)(d)
 - d. Environmental Management Plan (EMP) – Section (34)(b)
- ii. National Heritage Resources Act (NHRA) Act 25 of 1999
 - a. Protection of Heritage Resources – Sections 34 to 36; and
 - b. Heritage Resources Management – Section 38
- iii. Mineral and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
 - a. Section 39(3)
- iv. Development Facilitation Act (DFA) Act 67 of 1995
 - a. The GNR.1 of 7 January 2000: Regulations and rules in terms of the Development Facilitation Act, 1995. Section 31.

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that, “no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority...”. The NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through NEMA, MPRDA and the DFA legislation. In the latter cases, the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorizations are granted for development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Sections of these Acts relevant to heritage (Fourie, 2008).

The NEMA 23(2)(b) states that an integrated environmental management plan should, “...identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage”.

A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken account of in the

Regulations under NEMA is the Specialist Report requirements laid down in Section 33 of the regulations (Fourie, 2008).

1.5 Terminology and Abbreviations

Archaeological resources

This includes:

- i. material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- ii. rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- iii. wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- iv. features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

- i. construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- ii. carrying out any works on or over or under a place;
- iii. subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- iv. constructing or putting up for display signs or boards;

- v. any change to the natural or existing condition or topography of land; and
- vi. any removal or destruction of trees, or removal of vegetation or topsoil

Early Stone Age

The archaeology of the Stone Age, between 700 000 and 2 500 000 years ago.

Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means any place or object of cultural significance.

Holocene

The most recent geological time period which commenced 10 000 years ago.

Late Stone Age

The archaeology of the last 20 000 years associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

Middle Stone Age

The archaeology of the Stone Age between 20-300 000 years ago, associated with early modern humans.

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Table 1: Abbreviations

ABBREVIATIONS	DESCRIPTION
AIA	Archaeological Impact Assessment
ASAPA	Association of Southern African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

Refer to **Appendix A** for further discussions on heritage management and legislative frameworks.

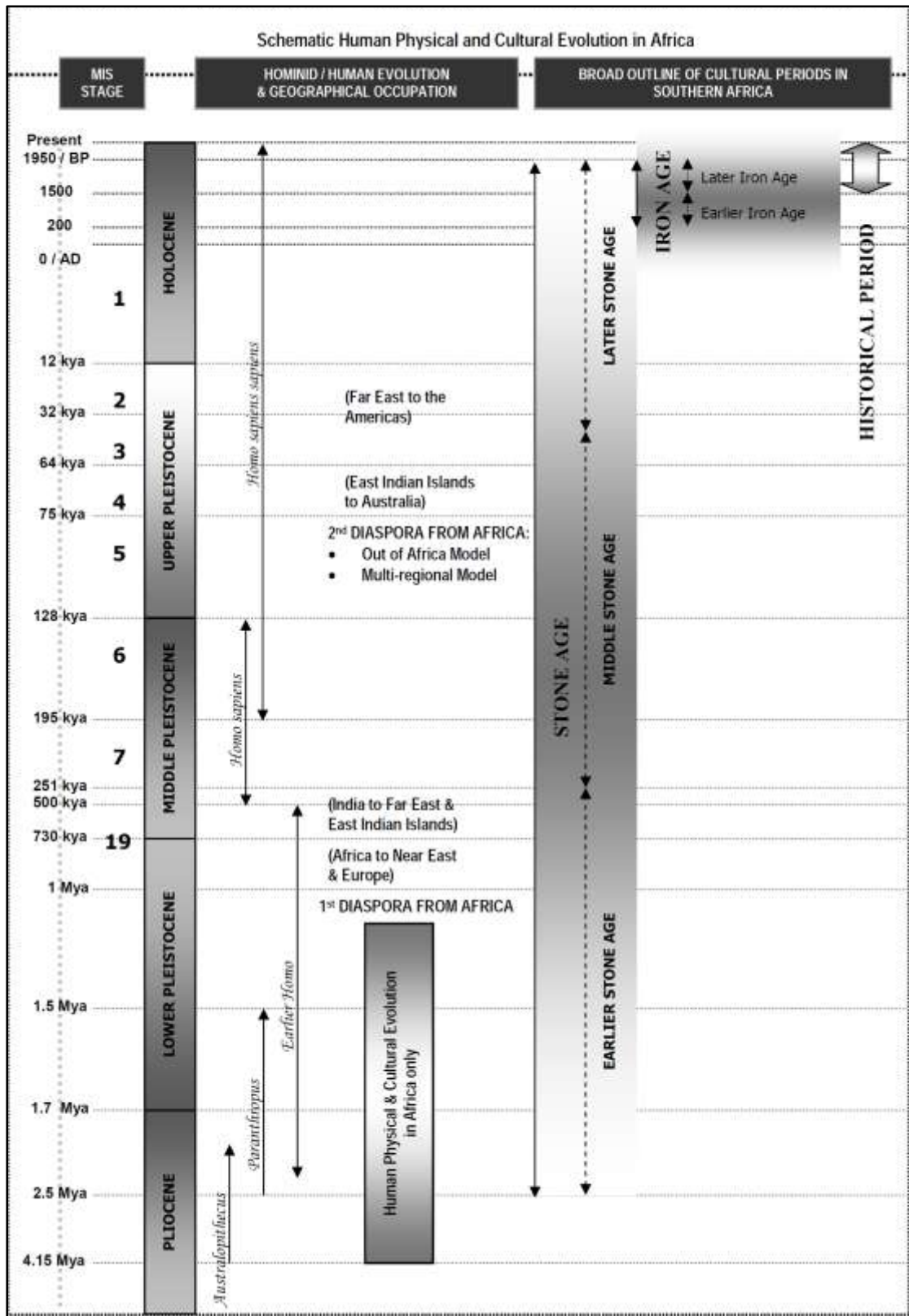


Figure 1 – Human and Cultural Timeline in Africa (Morris, 2008)

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location and Description

The Eskom Watershed Substation is located 6 km north of the town of Lichtenburg, just off the R505 road, in the Ngaka Modiri Molema District Municipality, which is situated in the-central-east part of the North-West Province, south-east of the provincial capital of Mahikeng (Figure 2. The town of Lichtenburg is located in the Ditsobotla Local Municipality. The project involves the development of four additional 132kV power lines, within the property boundary of the existing Eskom Watershed substation Error! Reference source not found., which is located on Portion 50 of the farm Lichtenburg Town and Townlands 27 IP.

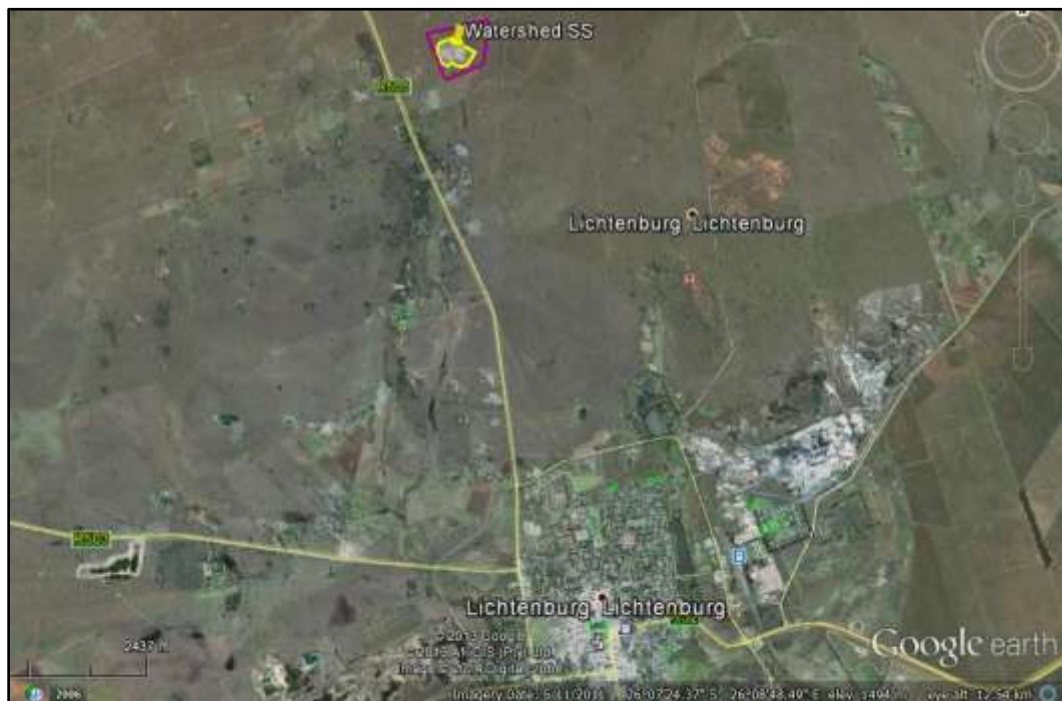


Figure 2 - Watershed Substation Locality Map (Google earth)



Figure 3 – Detailed plan of study area (between the purple and yellow lines)

2.2 Site Description

Location	<p>GPS: S26° 05'23.14"; E26° 08'40.91"</p> <p>The proposed development site is situated on the existing Watershed substation property located on Portion 50 of the farm Lichtenburg Town and Townlands 27 IP, located immediately north of the town of Lichtenburg, District Municipality, North-West Province.</p>
Land	Approximately 24.93 Hectares of land under option
Land Description	<p>The majority of the property contains the Eskom Watershed Substation and several existing power lines. The remainder of the land is not utilised currently and consists of fairly flat terrain which is covered with secondary grassland and stands of isolated trees. The vegetation is quite dense on the western section of the study area.</p>

The site incorporating the Project contains the existing Eskom Watershed Substation and several existing power lines. The property is located on Portion 50 of the farm Lichtenburg Town and Townlands 27 IP, situated immediately north of the town of Lichtenburg, District Municipality, North-West Province. The study area comprises the vacant land between the fence of the existing substation and the property boundary fence and is approximately 24.93ha

in area. This land is currently used for grazing. Vegetation on the proposed project site is limited to a few species of grass and small, woody shrubs, with isolated stands of trees. The vegetation is quite dense on the western section of the study area.

2.3 Technical Project Description

Four additional 132kV lines are proposed to be added to the existing Eskom Watershed Substation, within the greater substation property boundary (indicated by the pink lines on Figure 4).

[WAITING FOR DETAILS, TO BE INSERTED IN FINAL VERSION]



Figure 4 – Location of the proposed four additional power lines (pink lines) (from Eskom)

3 ASSESSMENT METHODOLOGY

The section below outlines the assessment methodologies utilised in the study.

3.1 Methodology for Assessing Heritage Site significance

This Heritage Impact Assessment (HIA) report was compiled by PGS Heritage (PGS) for the proposed construction of four additional power lines at the Eskom Watershed Substation, north of Lichtenburg, in the North West Province. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the National Environmental Management Act (NEMA) (no 107 of 1998). The HIA process consisted of three steps:

Step I – Literature Review: The background information to the field survey relies greatly on the Heritage Background Research.

Step II – Physical Survey: A physical survey was conducted on foot, by a heritage specialist of PGS, through the proposed project area, which aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

Step III – The final step involved the recording and documentation of identified heritage resources, the assessment of resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations.

The significance of identified heritage sites was based on four main criteria:

- Site integrity (i.e. primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter)
 - Low - <10/50m²
 - Medium - 10-50/50m²
 - High - >50/50m²
- Uniqueness; and
- Potential to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

- A** - No further action necessary;
- B** - Mapping of the site and controlled sampling required;
- C** - No-go or relocate development activity position;
- D** - Preserve site, or extensive data collection and mapping of the site; and
- E** - Preserve site.

Impacts on these sites by the development will be evaluated as follows:

3.1.1 Site Significance

Site significance classification standards prescribed by the SAHRA (2006) and approved by the ASAPA for the Southern African Development Community (SADC) region, were used for the purpose of this report.

Table 2: Site significance classification standards as prescribed by SAHRA.

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium Significance	Recording before destruction
Generally Protected C (GP.A)	Grade 4C	Low Significance	Destruction

3.2 Methodology for Impact Assessment

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 3**.

Table 3: Quantitative rating and equivalent descriptors for the impact assessment criteria

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	<i>Isolated site</i>	<u>Incidental</u>
2	LOW	<i>Study area</i>	<u>Short-term</u>
3	MODERATE	<i>Local</i>	<u>Medium-term</u>
4	HIGH	<i>Regional / Provincial</i>	<u>Long-term</u>
5	VERY HIGH	<i>Global / National</i>	<u>Permanent</u>

A more detailed description of each of the assessment criteria is given in the following sections.

3.2.1 Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1000 km²) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed, the impact would be VERY HIGH if only 100

ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in **Table 4** below.

Table 4: Description of the significance rating scale

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.

3.2.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 5**.

Table 5: Description of the significance rating scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50 km from the proposed site.
3	Local	The impact will affect an area up to 5 km from the proposed site.
2	Study Area	The impact will affect a route corridor / site not exceeding the boundary of the site.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the site.

3.2.3 Duration Scale

In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table 6**.

Table 6: Description of the temporal rating scale

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of the project.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

3.2.4 Degree of Probability

The probability or likelihood of an impact occurring will be described as shown in **Table 7** below.

Table 7: Description of the degree of probability of an impact occurring

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

3.2.5 Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard “degree of certainty” scale is used, as discussed in Table 8. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 8: Description of the degree of certainty rating scale

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

3.2.6 Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner, in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale as described below:

$$\text{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \text{Spatial} + \text{Temporal}) \times \text{Probability}}{5}$$

3

5

An example of how this rating scale is applied is shown below:

Table 9: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	LOW	Local	Medium Term	Could Happen	
Impact to heritage	2	3	3	3	1.6

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criterion rating of 2.67. The probability (3) is divided by 5 to give a probability rating of 0.6. The criteria rating of 2.67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to 5 classes as described in the table below.

Table 10: Impact Risk Classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

Therefore with reference to the example used for air quality above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

4 BACKGROUND RESEARCH

The archival research focused on available information sources (historical maps, literature survey, etc.) that were used to compile a background history of the study area and surrounds. This data then informed the possible heritage resources to be expected during field surveying of the current study area.

The archaeological and historical literature search provided the following information, which has been compiled into an overview of the significant archaeological and historical sites and events relevant to the study area and surrounding landscape.

4.1 Cartographic Analysis

Due to the small size and previously disturbed nature of the study area (the existing substation would have involved extensive excavation and construction disturbance), it was deemed not necessary to undertake a cartographic analysis of the study area.

4.2 Previous historical studies

HIA Reports from SAHRIS Database

A search of the SAHRIS (SA Heritage Resources Information System) database identified the following Heritage Impact Assessment (HIA) and Palaeontological Impact Assessment (PIA) reports for the study area and general surrounding region:

- Cultural Heritage Resources Impact Assessment of Portion 151 Of Lichtenburg Town and Townlands 27 IP (Lichtenburg Extension 10), North West Province. Dr Udo Kusel. African Heritage Consultants CC. Prepared for Lockeport Projects (Pty) Ltd. July 2008
- Heritage Impact Report for the Proposed 88kv Power Line from Watershed Substation, Lichtenburg, to the Mmabatho Substation, North West Province. J van Schalkwyk. Prepared for Arcus Gibb. November 2008.
- Cultural Heritage Resources Impact Assessment of a Feedlot on the Farm Kalkfontein, Lichtenburg District, North West Province. Dr Udo Kusel. African Heritage Consultants CC. Prepared for EkoInfo CC. May 2011.
- Heritage Impact Assessment for the Proposed Lichtenburg Solar Park, North-West Province. Compiled for Africa Geo-Environmental Services (AGES) by Marko Hutten, Hutten Heritage Consultants. May 2012.
- Lichtenburg Solar Park, North West Province - Palaeontological Impact Assessment. Prof. Bruce Rubidge. Prepared for AGES (Pty) Ltd. July 2012.

The above-noted studies identified the following sites:

Archaeological and Historical Sites:

- No sites dating to the Stone Age were identified in the region of the study area
- No sites dating to the Iron Age were identified in the region of the study area.
- A number of features dating to the historic period were identified in the region surrounding the study area. This includes the remains of an old house in Bakerville, and a number of cemeteries. However, none of these sites is located within or adjacent to the study area.

Palaeontological sites:

The PIA for the Lichtenburg Solar Park, which is located 10 km immediately north of the Watershed Substation study area, noted the following:

- The entire area affected by the development of the Solar Park is underlain by rocks of the Monte Christo Formation, Malmani Subgroup of the Transvaal Sequence comprising mainly chert, quartzite, and dolomite.
- The rocks of the Malmani Group, which outcrop extensively in South Africa, are known to preserve fossils of stromatolites. However, no stromatolites were found in the study area.
- The recommendation was that it is unlikely that rock outcrops will be exposed by the development and equally unlikely that Quaternary rocks bearing fossil bones would be exposed in the process of development activities.

4.3 Archival findings

The aim of the archival background research is to identify possible heritage resources that could be encountered during the field work, as summarised in **Table 11**.

Table 11: Summary of History of Lichtenburg Town and Surrounding Area

DATE	DESCRIPTION
2.5 million to 250 000 years ago	The Earlier Stone Age (ESA). The Earlier Stone Age is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these technological phases is known as Oldowan which is associated with crude flakes and hammer stones and dates to approximately 2 million years ago. The second technological phase in the Earlier Stone Age is known as the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial handaxe. The Acheulian phase dates back to approximately 1.5

	<p>million years ago. The rock engraving site at Bosworth Farm, near Klerksdorp also contains many stone artefacts (lithics) which date to over one million years ago (http://www.nasmus.co.za/departments/rock-art/public-rock-art-sites). No sites are known in or near the study area.</p>
250 000 to 40 000 years ago	<p>The Middle Stone Age (MSA). The Middle Stone Age is the second oldest phase identified in South Africa’s archaeological history. It is associated with flakes, points and blades manufactured by means of the prepared core technique. No sites are known in the vicinity of the study area.</p>
40 000 years ago to the historic past	<p>The Later Stone Age (LSA) is the third phase in South Africa’s Stone Age history. It is associated with an abundance of very small stone artefacts (microliths). The Later Stone Age is also associated with rock engravings and rock paintings. Rock engravings are known from the wider vicinity of the study area (Bergh, 1998). See below for two well-known sites in the greater vicinity of the study area (Thaba Sione and Bosworth Farm).</p>
Rock Art	<p>Thaba Sione: this site is located in the middle of Thaba Sione town, some 60km south-west of Mmabatho. The site contains over 559 engravings located on rocks and boulders. The engravings are dominated by depictions of rhinoceros – some have been rubbed smooth. There are also buffalo, eland, shamanic human figures, wildebeest and a rare lizard. The site is still important today to local Tswana people and is used by the Zion Christian Church as a rain-making centre. (http://www.nasmus.co.za/departments/rock-art/public-rock-art-sites)</p> <p>Bosworth Farm: this site is located some 22km north-west of Klerksdorp on the Bosworth Farm property. It is a large site with over 400 San and Khoe (herder) rock engravings. There many depictions of human figures as well as animals: a charging rhinoceros, a large elephant, a flight of birds. There are also many geometric motifs. The site also has many stone artefacts (lithics) which date to over one million years ago. Bosworth is one of South Africa’s 12 Rock Art sites formally protected under the National Heritage Resources Act (25 of 1999). (http://www.nasmus.co.za/departments/rock-art/public-rock-art-sites)</p>
AD 200 - 900	<p>Early Iron Age (EIA). Known sites in the region include Kruger Cave near Rustenburg and Broederstroom near Hartebeespoort Dam. Both sites are located to the east of the study area and date to approximately 460 AD (Mason 1974). No recorded sites were located within the study area during the desktop study.</p>
AD 900 - 1300	<p>Middle Iron Age (MIA). No recorded sites were located during the desktop study.</p>

AD 900 - 1840 Late Iron Age (LIA). Various well-known sites from this period are located in the greater North-West Province, including the stone walled complexes at Buispoort and Braklaagte, the Makgame megasite, the 18th century capital at Kaditshwene and the copper mines at Dwarsberg in the Madikwe Game Reserve. These sites date to between the 15th and 19th centuries and record the arrival and development of the early Moloto Sotho-Tswana speakers (Boeyens, 2003).

Four groups are of importance in the study area. These are the Bakolobeng, Batlounge, Banogeng, and the Barolong. The following information was derived from a study conducted by the Lichtenburg Museum under P. M. Ntamu, 1996. The origins of the tribes of the Lichtenburg area follows (Fourie, 2009).

The Bakolobeng:

Oral sources indicate that the Bakolobeng originated from Tsaong near Silverkrans. Chief Kelly Molete concurs with Breutz's informants that the Bakolobeng were led through the present Kwena-Reserve of Botswana by Chief VI Molete-wa-Modikwagae in about 1769 or 1770, and later moved to Tsaong. Around 1830, they experienced a difficult period, which began with the death of their Chief, Kgosi VIII Molete when the Ndebele Group attacked them. This period of Difagane was also characterised by the Bakolobeng's flight to Thaba 'Nchu (in the Free State) and to Dimawe (Klerksdorp District) where they joined other refugees like the Batlounge and Banogeng. After 1837, the Thaba 'Nchu Group of the Bakolobeng returned and settled temporarily at Bodumatau (Lichtenburg District) until they came into contact with Hermannsburg Mission.

Batlounge:

They are also known as Batlhako, because they were originally with the Batlhako when they departed from the present Pretoria District and migrated to the areas of Rustenburg in about 1650. Oupa Mogorosi, one of the oldest informants, stated that: "... (they) departed from Mabalstadt along with Baphiring ... who controlled a section of people who were later to settle at Putfontein." Breutz's informants hold that in about 1750, the Batlounge became an independent chiefdom and went to settle at Dipakane, in the Klerksdorp area. The Batlounge later went to stay in a farm at Gruisfontein, accompanied by Rev Schnell of the Hermannsburg Lutheran Mission. At that time the Tribe was so scattered that one section was at Bodibe (Polfontein)

and other places in the district. The idea of buying a farm as their ultimate settlement brought them together.

Banogeng:

According to oral sources collected by Breutz, the Banogeng are believed to be an ancient branch of the Digoja, i.e. forerunners of the Batswana Tribes who passed the Mafikeng area in small clan units. They are believed to be related to the Bakubung, Bataung and the Barolong Tribes, who originally shared the same totem; Tholo (Kudu) with them. For reasons better known to themselves; the Banogeng were destroyed and separated even before the period of Mzilikatzi attacks, except for remnants who stayed in the Lichtenburg District. The Ndebele continued to pose a threat to them so that they fled to Dimawe in the District of Klerksdorp. Here they merged with refugees from Baphiring, Batlounge and Bakolobeng Tribes. Except for those who were assimilated into the already mentioned tribal groups, Ramosiane attempted to gather the remains of the Banogeng. They stayed at Kolong (Rietfontein) until 1960 when the tribe applied for its recognition and the re-establishment of the tribe.

The two Barolong tribes:

There are presently so many Barolong Tribes whose origin has been attributed to the first Chief Morolong, and the second Chief Noto. It is interesting to note that the totems, Tholo (Kudu) and Tshipi (Iron), were respectively taken from the names of the Chiefs mentioned. In his book, "History of the Batswana", Natal, 1989, Breutz indicate that "the first Tswana Tribe to come to South Africa under the rule of a Chief were the Barolong who arrived sometime between 1 200 and 1 300 or earlier".

These migrations which continued even beyond the years 1450 and 1700 made the divisions of the Batswana Tribes like the Bahurutshe and the Bakwena more conspicuous. From 1823 - 1830, several Barolong Tribes fled from their Tribal land in the Transvaal as a result of Bataung raids and the Mzilikazi raids.

Towards the end of the eighteenth century, the Barolong had divided into four groups, under Rratlou, Rrapulana, Seleka and Tshidi. The first two groups, namely the Barolong Boo-Ratlou and the Barolong Boo-Rapulana came to stay in the District of Lichtenburg. The Barolong Boo-Rapulana's residence was Lotlhakane (Rietfontein) in the Lichtenburg District. In 1882 moved to Bodibe (Polfontein) in the District of Lichtenburg. The last of the Barolong Boo-Ratloung, Chief Noto Moswete and his tribe

were moved to Kopela.

AD 1873

Historical period

The town of Lichtenburg: Hendrik Adriaan Greeff was born on the farm Lichtenburg close to Durbanville in the Cape Province. He became a hunter and started to frequent the then ZAR area. Greeff settled in the late 1860 on the farms Doornfontein and Kaalplaats. Potchefstroom was the closest trading centre and approximately 150 km or "14 uur rijdens te paarde" away. A need for a town with a church and shops became stronger and Greeff and the Boers in the area saw Doornfontein with its abundant water, firewood and building material as the designated place.

In 1865 the first application for town establishment was addressed to the House of Assembly, signed by 132 males in the area, and they started compiling a number of town regulations. Greeff wanted to name the town Lichtenburg, a name that he carried from his birth and because he wanted it to be a town whose light would shine over the area, not just with regard to hospitality and prosperity, but also in respect of religion.

In 1868 the name "Lichtenberg", (a mistake still commonly made) appeared on the official map of the SAR, but the House of Assembly did not react yet. The men met again to discuss the town regulations and to obtain an appeal on speedy proclamation from the House of Assembly. The well-known Voortrekker savant, JG Bantjes, also established himself in Lichtenburg and signed the regulation as witness.

Eventually Lichtenburg was officially proclaimed as town in mid-winter on 25 July 1873 by Pres. TF Burgers. (Lichtenburg Museum, 2009; cited in Fourie 2009).

1900-1902

Boer War

During the Boer War the town of Lichtenburg was occupied by a British garrison of 620 men under the command of Lieutenant-Colonel CGC Money. The market square was turned into a fortified redoubt and strong pickets and sangars on the outskirts of town. On 3 March 1901, General De la Rey planned to attack the town with the help of General Cilliers and Commandant Lemmer and their followers, amounting to 1200 men. An attacking force of between 300-400 men was to assault the town. Due to the marshy terrain and a premature charge by General Liebenberg, the attack was repulsed with equal loses on both sides (Cloete, 2000).

Diamond

Diamond Rush 1927

Rush 1927

The Lichtenburg area is known for the 1926-27 diamond rush. In December 1924, a

diamond of 3 carats was discovered by the Voorendyk family on the farm Elandsputte. Initial prospecting in 1925 produced a high yield of diamonds and the area was proclaimed as a “diggings” in February 1926. By 1945 a total of 104 diggings were proclaimed on 13 farms. It was the richest public diggings in the world, with the biggest gathering of diggers in history. A shanty town rose within a year or two, which housed in the region of 150 000 people, about 5 times as big as Lichtenburg today. Bakers, called after the owner Albert Baker, and later known as Bakerville, was the "main town". Here the houses and shacks stood ‘cheek by jowl’ for several kilometers. In the business centre there were as many as 250 diamond buyers' offices, as well as about 60 cafes, shops, barbers, butcheries and other businesses (Lichtenburg Museum, 2009).

4.4 Palaeontology of the area

The following section is an extract from the Palaeontological Desktop Study, attached as **Appendix B**.

Geology

The study area is underlain by Vaalian aged Chert-rich Dolomites of the Monte Christo Formation, Malmani Subgroup, Chuniespoort Group, Transvaal Sequence.

The Monte Christo Formation begins with an erosive breccia and continues with stromatolitic and oolitic platformal dolomites (Johnson et al, 2006).

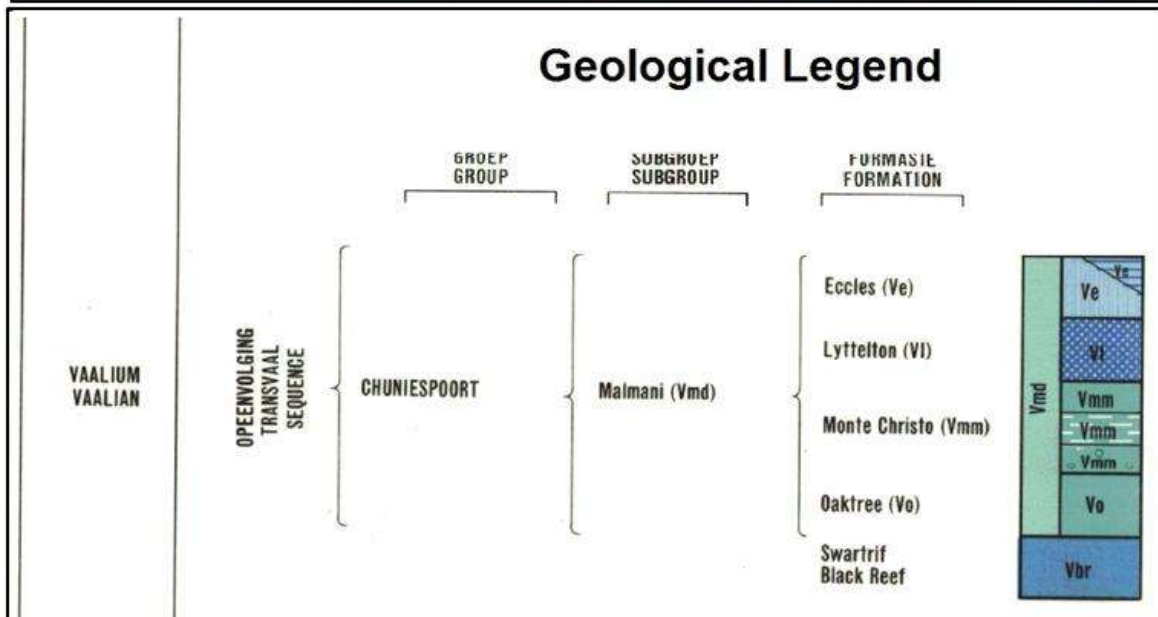


Figure 5 - Geology of the study area of the proposed additional power lines

4.4.1 Palaeontological Sensitivity

Due to the known occurrence of stromatolites within the dolomite of the Monte Christo Formation as well as the possibility of Cave Breccias being present, a **Moderate** Palaeontological sensitivity rating is given to the study area.

5 STATUS QUO

5.1 General site description

The study area is situated on the existing Watershed Substation property, located on Portion 50 of the farm Lichtenburg Town and Townlands 27 IP, situated immediately north of the town of Lichtenburg, North-West Province. The majority of the property contains the existing Eskom Watershed Substation and several existing power lines. The remainder of the land is not utilised currently and consists of fairly flat terrain which is covered with secondary grassland and isolated stands of trees. However, the vegetation is quite dense on the western section of the study area.

5.2 Field work methodology

One PGS staff member surveyed the study area over one day. A surface survey of the area was undertaken on foot. The survey focussed directly on the proposed study area for the construction of the additional four power lines. The general area was documented by means of various photographs (**Figure 6 to Figure 10**) and GPS coordinates were taken. Where sites of heritage significance were identified, a detailed site recording, including GPS co-ordinates, was made. The tracklog of the survey is shown in **Figure 11** and **Appendix C – Tracklogs**.



Figure 6 – View to substation fence from eastern side of property



Figure 7 – View of area from north-east corner property boundary (viewpoint 519)



Figure 8 – Line of stones near substation fence (probably stone clearing) – viewpoint 520



*Figure 9 –Area with grass and dense stands of trees on western side of the study area
(Viewpoint 521)*



Figure 10 – Modern Recent building at north-west corner of study area (viewpoint 522)



Figure 11 –Survey Tracklog (red) showing viewpoints of photos (numbered green dots)

5.3 Fieldwork findings

No sites of heritage significance were located. However, due to the subterranean nature of most archaeological sites (including graves), and the dense vegetation on the north-western side of the study area, it is possible that some sites may be identified during site-clearing or construction activities.

5.3.1 Palaeontology

The following colour coding method is used to classify a development area's palaeontological impact as illustrated in **Figure 12**:

- **Red colouration** indicates a very high possibility of finding fossils of a specific assemblage zone. Fossils will most probably be present in all outcrops on the site/route and the chances of finding fossils during the construction phase are very high.
- **Orange colouration** indicates a possibility of finding fossils of a specific assemblage zone either in outcrops or in bedrock on the site/route. Fossils will probably be present on the site/route and the chances of finding fossils during the excavation phase are high.

- **Green colouration** indicates that there is no possibility of finding fossils in that section of the site/route development.

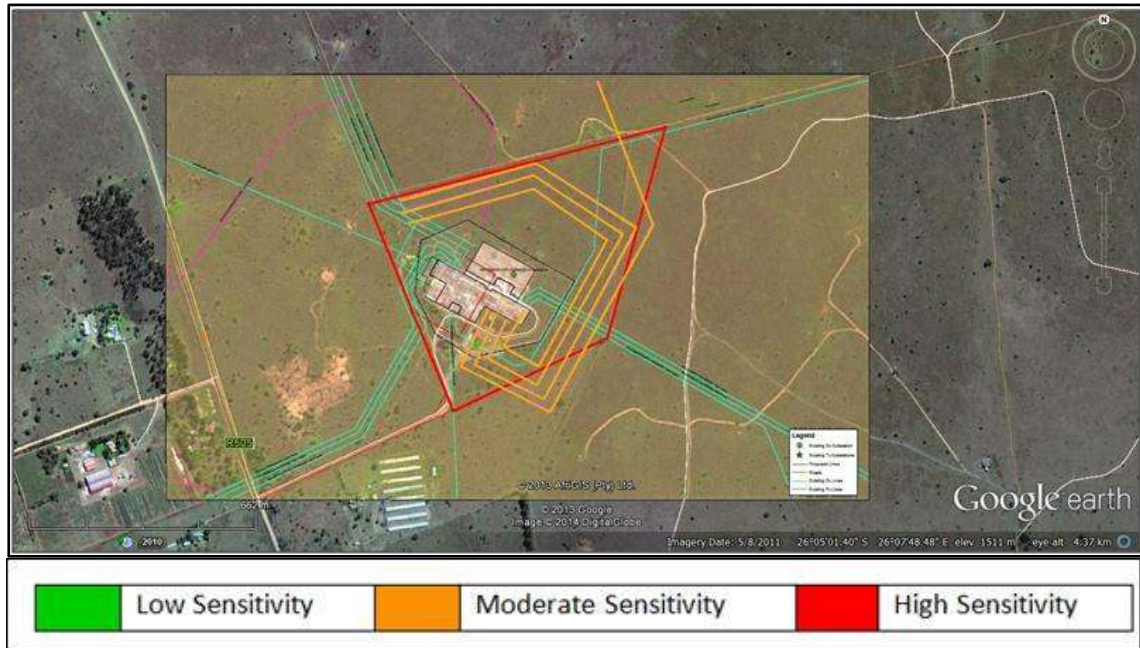


Figure 12 – Palaeontological Sensitivity Map

Due to the known occurrence of stromatolites within the dolomite of the Monte Christo Formation, as well as the possibility of Cave Breccias being present, a **Moderate** Palaeontological sensitivity rating is given to the study area.

Impact rating (No Mitigation)

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	MODERATE	Study Area	Permanent	Could happen	Low
Impact on palaeontology	3	2	5	4	2

The impact on palaeontological resources will **very likely** be of a MODERATE negative significance, affecting *the study area*. The impact will be *permanent* and could happen. The impact risk class is thus **Low**.

Impact rating (Mitigated)

With the implementing of the recommendations this impact can be mitigated and reduced and the impact on palaeontological resources will **very likely** be of a LOW negative significance,

affecting *Isolated sites*. The impact will be *permanent* and *could happen*. The impact risk class is then **Low**

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	LOW	Isolated Sites	Permanent	Could happen	Low
Impact on palaeontology	2	1	5	3	1.60

Recommendation:

The developer and the ECO of the project must be informed of the fact that Stromatolites have been recorded from the Monte Christo Formation and it is also possible that Caenozoic cave deposits may be present. If fossils are observed, a trained palaeontologist must be appointed to collect the fossils according to SAHRA specifications.

5.4 Cultural Landscape

Heritage significance of the cultural landscape is derived from the interaction between the natural landscape, and that landscape as created and changed by man and influenced by his construction of roads, bridges, farming landscapes (such as grazing fields, farmsteads, etc) and townscapes. Also interacting with these physical entities are intangible and historic landscapes and events that are known to have added to the cultural fabric of a place or area.

Since the landscape is already highly disturbed with the existing substation and power lines, the establishment of the proposed four additional power lines will not have a negative influence on the cultural landscape or characteristics of the area in the long term. Short term impacts will only be during construction and will be for the duration of the construction timeframe. Screening of construction activities as per usual construction requirements is recommended.

Impact rating

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Impact on heritage landscape	VERY LOW	Isolated Sites	Short-term	Unlikely	Very Low
	1	1	2	2	0.53

With the implementing of the recommendations this impact can be mitigated and reduced and the impact on heritage landscape will **very likely** be of a VERY LOW negative significance, affecting *isolated sites*. The impact will be *short-term* but *unlikely to happen*. The impact risk class is then **Very Low**.

Mitigation:

Screening of construction activities as per usual construction requirements is recommended. Monitoring of excavation activity by a palaeontologist may be necessary, depending on the size and depth of the footprint of the pylons to be used.

6 CONCLUSIONS AND RECOMMENDATIONS

During the heritage study no heritage sites of significance were identified in the study area footprint. However, the desktop Palaeontological Impact Assessment study identified the existence of geology that is likely to contain fossiliferous material that could be impacted by the proposed development.

Specific management and mitigation measures with regards to the possible palaeontological finds that can be made during construction activities are:

Palaeontology

The study area is underlain by Vaalian aged Chert-rich Dolomites of the Monte Christo Formation, Malmani Subgroup, Chuniespoort Group, Transvaal Sequence. The Monte Christo Formation begins with an erosive breccia and continues with stromatolitic and oolitic platformal dolomites.

Stromatolites are recorded from the dolomite layers. Highly fossiliferous Caenozoic cave breccias are also known to occur within the dolomite layers, but are not mapped individually. These fossiliferous deposits often contain more recent mammal and hominid fossils e.g. in the Cradle of Humankind.

Recommendation:

The developer and the ECO of the project must be informed of the fact that stromatolites have been recorded from the Monte Christo Formation and it is also possible that Caenozoic cave

deposits may be present. If fossils are observed a trained palaeontologist must be appointed to collect the fossils according to SAHRA specifications.

Cultural Landscape

The establishment of the proposed additional four power lines will not have a negative influence on the cultural landscape or characteristics of the area in the long term. Short term impacts will only be during construction and will be for the duration of the construction timeframe. Screening of construction activities as per usual construction requirements is recommended.

General

Further to these recommendations, the general Heritage Management Guidelines in Section 7 need to be incorporated into the EMP for the project.

The overall impact of the development on heritage resources is seen as acceptably low and impacts can be mitigated to acceptable levels.

7 HERITAGE MANAGEMENT GUIDELINES

7.1 General Management Guidelines

1. The National Heritage Resources Act (Act 25 of 1999) states that, any person who intends to undertake a development categorised as-
 - (a) the construction of a road, wall, transmission line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
 - (b) the construction of a bridge or similar structure exceeding 50m in length;
 - (c) any development or other activity which will change the character of a site-
 - (i) exceeding 5 000 m² in extent; or
 - (ii) involving three or more existing erven or subdivisions thereof; or
 - (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
 - (d) the re-zoning of a site exceeding 10 000 m² in extent; or
 - (e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In the event that an area previously not included in an archaeological or cultural resources survey is to be disturbed, the SAHRA needs to be contacted. An enquiry must be lodged with them into the necessity for a Heritage Impact Assessment.

2. In the event that a further heritage assessment is required it is advisable to utilise a qualified heritage practitioner, preferably registered with the Cultural Resources Management Section (CRM) of the Association of Southern African Professional Archaeologists (ASAPA).

This survey and evaluation must include:

- (a) The identification and mapping of all heritage resources in the area affected;
- (b) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7 of the National Heritage Resources Act;

- (c) An assessment of the impact of the development on such heritage resources;
 - (d) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
 - (e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
 - (f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
 - (g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.
3. It is advisable that an information section on cultural resources be included in the SHEQ training given to contractors involved in surface earthmoving activities. These sections must include basic information on:
- a. Heritage;
 - b. Graves;
 - c. Archaeological finds; and
 - d. Historical Structures.

This module must be tailor made to include all possible finds that could be expected in that area of construction.

- 4. In the event that a possible find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted.
- 5. The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.
- 6. If mitigation is necessary, an application for a rescue permit must be lodged with SAHRA.
- 7. After mitigation, an application must be lodged with SAHRA for a destruction permit. This application must be supported by the mitigation report generated during the rescue excavation. Only after the permit is issued may such a site be destroyed.
- 8. If during the initial survey sites of cultural significance are discovered, it will be necessary to develop a management plan for the preservation, documentation or destruction of such a site. Such a program must include an archaeological/palaeontological monitoring programme, timeframe and agreed upon schedule of actions between the company and the archaeologist.

9. In the event that human remains are uncovered, or previously unknown graves are discovered, a qualified archaeologist needs to be contacted and an evaluation of the finds made.
10. If the remains are to be exhumed and relocated, the relocation procedures as accepted by SAHRA need to be followed. This includes an extensive social consultation process.

The purpose of an archaeological/palaeontological monitoring programme¹ is:

- To allow, within the resources available, the preservation by recording of archaeological/palaeontological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works
- To provide an opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an archaeological/palaeontological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard.
- A monitoring programme is not intended to reduce the requirement for excavation or preservation of known or inferred deposits, and it is intended to guide, not replace, any requirement for contingent excavation or preservation of possible deposits.
- The objective of the monitoring programme is to establish and make available information about the archaeological resource existing on a site.

PGS can be contacted on the way forward in this regard.

¹ The definition of an archaeological/palaeontological monitoring programme is a formal program of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, in the inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.

Table 12: Roles and responsibilities of archaeological and heritage management

ROLE	RESPONSIBILITY	IMPLEMENTATION
A responsible specialist needs to be allocated and should attend all relevant meetings, especially when changes in design are discussed, and liaise with SAHRA.	The client	Archaeologist and a competent archaeology support team
If chance finds and/or graves or burial grounds are identified during construction or operational phases, a specialist must be contacted in due course for evaluation.	The client	Archaeologist and a competent archaeology support team
Comply with defined national and local cultural heritage regulations on management plans for identified sites.	The client	Environmental Consultancy and the Archaeologist
Consult the managers, local communities and other key stakeholders on mitigation of archaeological sites.	The client	Environmental Consultancy and the Archaeologist
Implement additional programs, as appropriate, to promote the safeguarding of our cultural heritage. (i.e. integrate the archaeological components into the employee induction course).	The client	Environmental Consultancy and the Archaeologist,
If required, conservation or relocation of burial grounds and/or graves according to the applicable regulations and legislation.	The client	Archaeologist, and/or competent authority for relocation services
Ensure that recommendations made in the Heritage Report are adhered to.	The client	The client
Provision of services and activities related to the management and monitoring of significant archaeological sites.	The client	Environmental Consultancy and the Archaeologist
After the specialist/archaeologist has been appointed, comprehensive feedback reports should be submitted to relevant authorities during each phase of development.	Client and Archaeologist	Archaeologist

7.2 All phases of the project

7.2.1 *Archaeology*

Based on the findings of the HIA, all stakeholders and key personnel should undergo an archaeological induction course during this phase. Induction courses generally form part of the employees' overall training and the archaeological component can easily be integrated into these training sessions. Two courses should be organised – one aimed more at managers and supervisors, highlighting the value of this exercise and the appropriate communication channels that should be followed after chance finds, and the second targeting the actual workers and getting them to recognize artefacts, features and significant sites. This needs to be supervised by a qualified archaeologist. This course should be reinforced by posters reminding operators of the possibility of finding archaeological/palaeontological sites.

The project will encompass a range of activities during the construction phase, including ground clearance, establishment of construction camps area and small scale infrastructure development associated with the project/operations.

It is possible that cultural material will be exposed during operations and may be recoverable, but this is the high-cost front of the operation, and so any delays should be minimised. Development surrounding infrastructure and construction of facilities results in significant disturbance, but construction trenches do offer a window into the past and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project and these must be catered for. Temporary infrastructure is often changed or added to during the subsequent history of the project. In general these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for.

During the construction/operational phase, it is important to recognise any significant material being unearthed, and to make the correct judgment on which actions should be taken. A responsible archaeologist/palaeontologist must be appointed for this commission. This person does not have to be a permanent employee, but needs to attend relevant meetings, for example when changes in design are discussed, and notify SAHRA of these changes. The archaeologist would inspect the site and any development on a recurrent basis, with more frequent visits to the actual workforce and operational areas.

In addition, feedback reports can be submitted by the archaeologist to the client and SAHRA to ensure effective monitoring. This archaeological monitoring and feedback strategy should be incorporated into the Environmental Management Plan (EMP) of the project. Should an archaeological/palaeontological site or cultural material be discovered during construction (or operation), such as burials or grave sites, the project needs to be able to call on a qualified expert to make a decision on what is required and if it is necessary to carry out emergency recovery. SAHRA would need to be informed and may give advice on procedure. The developers therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered. The project thus needs to have an archaeologist/palaeontologist available to do such work. This provision can be made in an archaeological/palaeontological monitoring programme.

7.2.2 Graves

In the case where a grave is identified during construction the following measures must be taken:

- Upon the accidental discovery of graves, a buffer of at least 20 meters should be implemented.
- If graves are accidentally discovered during construction, activities must cease in the area and a qualified archaeologist be contacted to evaluate the find. To remove the remains a permit must be applied for from SAHRA and other relevant authorities. The local South African Police Services must immediately be notified of the find.
- Where it is recommended that the graves be relocated, a full grave relocation process that includes comprehensive social consultation must be followed.

The grave relocation process must include:

- i. A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, that will be at least 60 days in length;
- ii. Site notices indicating the intent of the relocation;
- iii. Newspaper notices indicating the intent of the relocation;
- iv. A permit from the local authority;
- v. A permit from the Provincial Department of Health;
- vi. A permit from the South African Heritage Resources Agency, if the graves are older than 60 years or unidentified and thus presumed older than 60 years;
- vii. An exhumation process that keeps the dignity of the remains intact;

- viii. The whole process must be done by a reputable company that is well versed in relocations;
- ix. The exhumation process must be conducted in such a manner as to safeguard the legal rights of the families as well as that of the developing company.

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<http://www.sahra.org.za/sahris>

1 General principles

In areas where there has not yet been a systematic survey to identify conservation worthy places, a permit is required to alter or demolish any structure older than 60 years. This will apply until a survey has been done and identified heritage resources are formally protected.

Archaeological and palaeontological sites, materials, and meteorites are the source of our understanding of the evolution of the earth, life on earth and the history of people. In the NHRA, permits are required to damage, destroy, alter, or disturb them. People who already possess material are required to register it. The management of heritage resources is integrated with environmental resources and this means that before development takes place heritage resources are assessed and, if necessary, rescued.

In addition to the formal protection of culturally significant graves, all graves, which are older than 60 years and are not in a formal cemetery (such as ancestral graves in rural areas), are protected. The legislation protects the interests of communities that have an interest in the graves: they should be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle are to be identified, cared for, protected and memorials erected in their honour.

Anyone who intends to undertake a development must notify the heritage resource authority and if there is reason to believe that heritage resources will be affected, an impact assessment report must be compiled at the construction company's cost. Thus, the construction company will be able to proceed without uncertainty about whether work will have to be stopped if an archaeological or heritage resource is discovered.

According to the National Heritage Act (Act 25 of 1999 section 32) it is stated that:

An object or collection of objects, or a type of object or a list of objects, whether specific or generic, that is part of the national estate and the export of which SAHRA deems it necessary to control, may be declared a heritage object, including –

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- visual art objects;
- military objects;
- numismatic objects;
- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1 (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives; and
- any other prescribed category.

Under the National Heritage Resources Act (Act No. 25 of 1999), provisions are made that deal with, and offer protection to, all historic and pre-historic cultural remains, including graves and human remains.

2 Graves and cemeteries

Graves younger than 60 years fall under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and are under the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the Office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning, or in some cases the MEC for Housing and Welfare. Authorisation for exhumation and reinterment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. In order to handle and transport human remains, the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

Graves older than 60 years, but younger than 100 years, fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and are under the jurisdiction of the South African Heritage Resource Agency (SAHRA). The procedure for Consultation Regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administered by a local authority. Graves in the category located inside a formal cemetery administered by a local authority will also require the same authorisation as set out for graves younger than 60 years, over and above SAHRA authorisation.

If the grave is not situated inside a formal cemetery but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the cemetery authority must be adhered to.

**APPENDIX B
PALAEONTOLOGICAL DESKTOP ASSESSMENT**

**PALAEONTOLOGICAL DESKTOP ASSESSMENT FOR THE
PROPOSED DEVELOPMENT OF FOUR NEW
POWERLINES AT THE WATERSHED SUBSTATION NEAR
THE TOWN OF LICHTENBURG, DITSOBOTLA DISTRICT
MUNICIPALITY, CENTRAL MUNICIPALITY IN THE
NORTH WEST PROVINCE**

For:

HIA CONSULTANTS



DATE: 15 January 2014

By

GIDEON GROENEWALD

EXECUTIVE SUMMARY

Gideon Groenewald was appointed by PGS Heritage to undertake a desktop survey, assessing the potential palaeontological impact of the proposed development of four new 132kV powerlines at the Watershed Substation, near the town of Lichtenburg in the North West Province.

This report forms part of the Basic Assessment Report for this project and complies with the requirements of the South African National Heritage Resource Act, No 25 of 1999. In accordance with Section 38 (Heritage Resources Management) of the Act, a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint of the development.

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. Most development study areas have never been surveyed by a palaeontologist.

The project entails the development of four new 132kV powerlines on the Substation property. The study area is located approximately 6km north of Lichtenburg in the North West Province, near the R505.

The study area is underlain by Vaalian aged Chert-rich Dolomites of the Monte Christo Formation, Malmani Subgroup, Chuniespoort Group, Transvaal Sequence. The Monte Christo Formation begins with an erosive breccia and continues with stromatolitic and oolitic platformal dolomites.

Stromatolites are recorded from the dolomite layers. Highly fossiliferous Caenozoic cave breccias are also known to occur within the dolomite layers, but are not mapped individually. These fossiliferous deposits often contain more recent mammal and hominid fossils, e.g. in the Cradle of Humankind.

Recommendation:

The developer and the ECO of the project must be informed of the fact that stromatolites have been recorded from the Monte Christo Formation and it is also possible that Caenozoic cave deposits may be present. If fossils are observed, a trained palaeontologist must be appointed to collect the fossils according to SAHRA specifications.

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1 INTRODUCTION

1.1 Background

Gideon Groenewald was appointed by PGS Heritage to undertake a desktop survey, assessing the potential palaeontological impact of the proposed development of four new 132kV Powerlines at the Watershed Substation near the town of Lichtenburg in the North West Province.

This report forms part of the Basic Assessment Report for this project and complies with the requirements of the South African National Heritage Resource Act, No 25 of 1999. In accordance with Section 38 (Heritage Resources Management) of the Act, a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint of the development.

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;
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

1.2 Aims and Methodology

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.

In preparing a palaeontological desktop study, the potential fossiliferous rock units (groups, formations etc.) represented within the study area are determined from geological maps. The known fossil heritage within each rock unit is inventoried from the published scientific literature and previous palaeontological impact studies in the same region.

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 extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1.1 below.

Table 0.1 Palaeontological Sensitivity Analysis Outcome Classification

Sensitivity	Description
Low Sensitivity	Areas where a negligible impact on the fossil heritage is likely. This category is reserved largely for areas underlain by igneous rocks. However, development in fossil bearing strata with shallow excavations or with deep soils or weathered bedrock can also form part of this category.
Moderate Sensitivity	Areas where fossil bearing rock units are present but fossil finds are localised or within thin or scattered sub-units. Pending the nature and scale of the proposed development the chances of finding fossils are moderate. A field-based assessment by a professional palaeontologist is usually warranted.
High Sensitivity	Areas where fossil bearing rock units are present with a very high possibility of finding fossils of a specific assemblage zone. Fossils will most probably be present in all outcrops and the chances of finding fossils during a field-based assessment by a professional palaeontologist are very high. Palaeontological mitigation measures need to be incorporated into the Environmental Management Plan

1.3 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. 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 tectonism or weathering, or are buried beneath a thick mantle of unfossiliferous "drift" (soil, alluvium etc.).

2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

The project entails the development of four new 132kV Powerlines on the property of the existing Watershed Substation, located approximately 5km north of Lichtenburg in the North West Province, near the R505.



Figure 0.1 Image showing the locality of the site

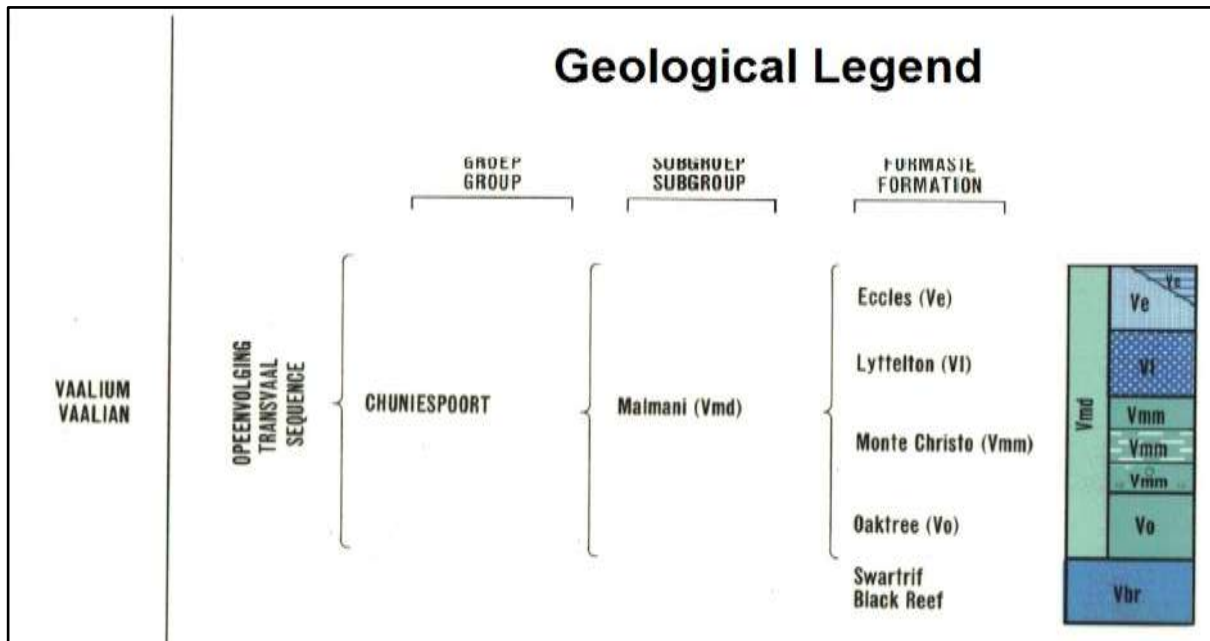
3 GEOLOGY

The study area is underlain by Vaalian aged Chert-rich Dolomites of the Monte Christo Formation, Malmani Subgroup, Chuniespoort Group, Transvaal Sequence.

The Monte Christo Formation begins with an erosive breccia and continues with stromatolitic and oolitic platformal dolomites (Johnson *et al*, 2006).



Figure 0.2. Geology of the study area. (Farm boundary is outlined in red and the new powerlines are shown as purple)



4 PALAEOLOGY OF THE AREA

Stromatolites are recorded from the dolomite layers. Highly fossiliferous Caenozoic cave breccias are also known to occur within the dolomite layers, but are not mapped individually. These fossiliferous deposits often contain more recent mammal and hominid fossils e.g. in the Cradle of Humankind.

5 PALAEOLOGICAL SENSITIVITY

Due to the known occurrence of stromatolites stromatolites within the dolomite of the Monte Christo Formation, as well as the possibility of Cave Breccias being present, a Moderate Palaeontological sensitivity rating is given to the study area.

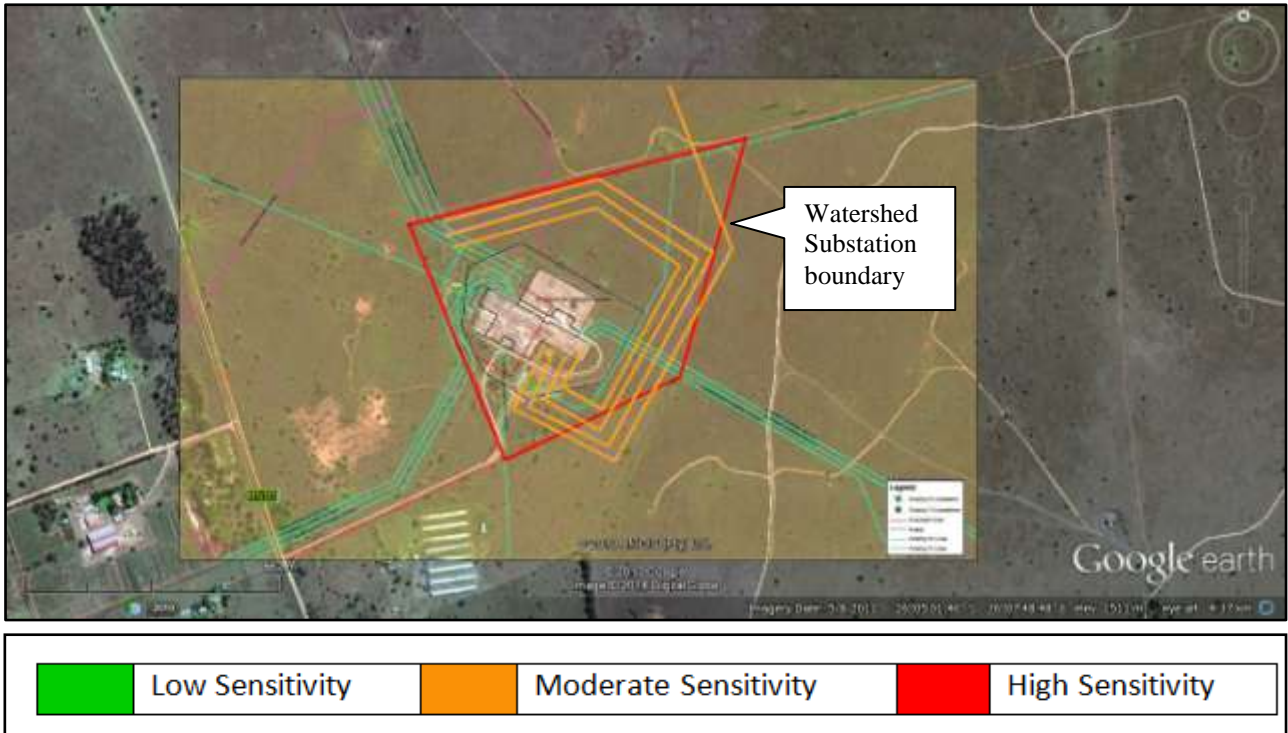


Figure 0.3 Palaeontological Sensitivity of the proposed new powerlines at the Watershed Substation

6 CONCLUSION AND RECOMMENDATIONS

The study area is underlain by Vaalian aged dolomite of the Monte Christo Formation, Chuniespoort Group. Stromatolites are known to occur within these deposits and more modern fossiliferous Caenozoic cave breccias have been recorded associated with carst formation in the dolomite.

Recommendation:

The developer and the ECO of the project must be informed of the fact that tromatolites **Stromatilites** have been recorded from the Monte Christo Formation and it is also possible that Caenozoic cave deposits may be present. If fossils are observed, a trained palaeontologist must be appointed to collect the fossils according to SAHRA specifications.

7 REFERENCES

Johnson MR, Anhausser CR and Thomas RJ. 2006. The Geology of South Africa. Geological Society of South Africa.

8 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald holds 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 palaeoecological 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).

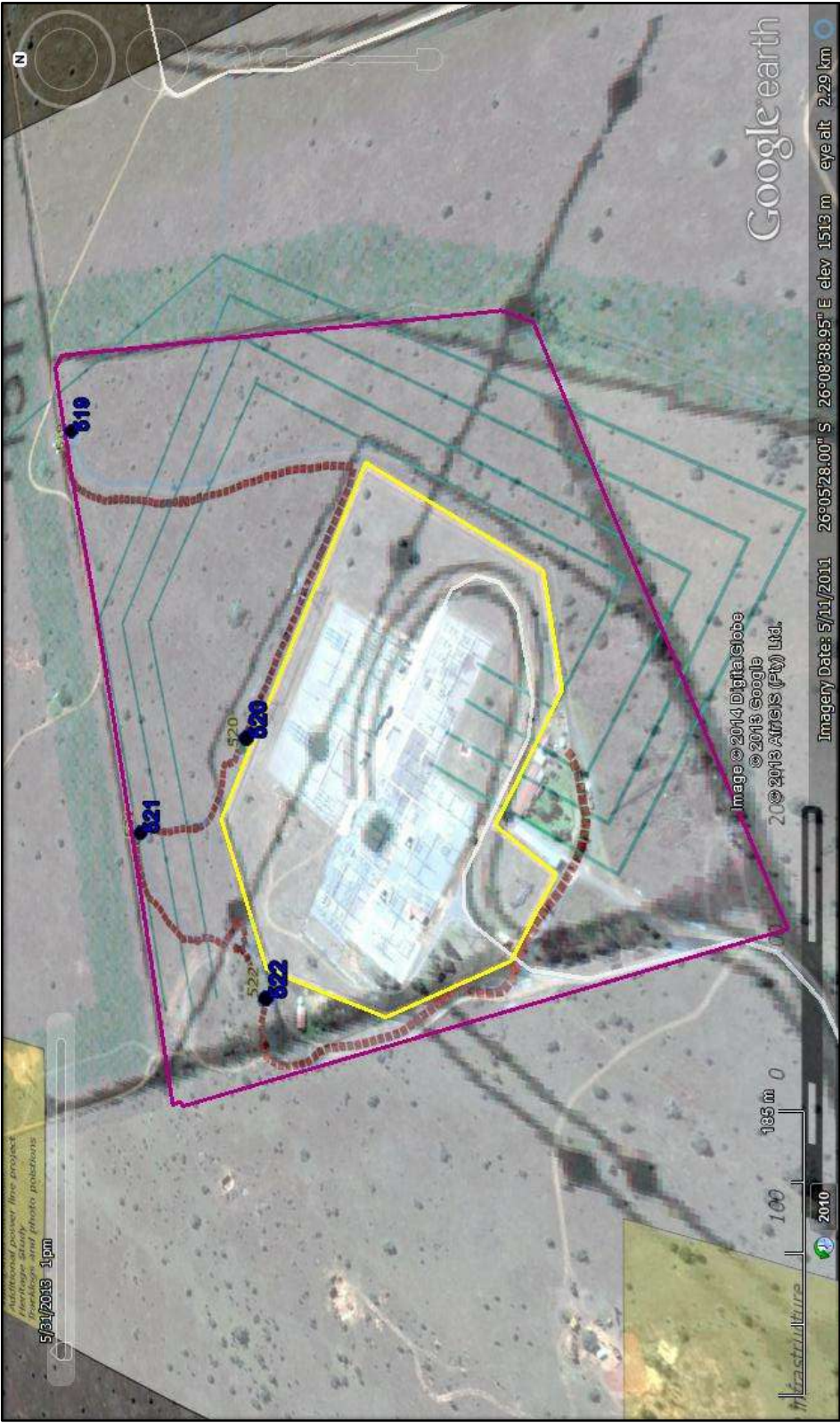
9 DECLARATION OF INDEPENDENCE

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.

A handwritten signature in dark ink, appearing to read 'Gideon Groenewald', with a stylized flourish at the end.

Dr Gideon Groenewald
Geologist

APPENDIX C
HERITAGE MAP AND SURVEY TRACKLOG



Map showing tracklog (red line) and photo view points (numbered blue dots)