



GROOTEGELUK MINE CONSTRUCTION CAMP DEVELOPMENT

Proposed Development of the Grootegeluk Mine Construction Camp for the Market Coke and Co-Generation Plant Project on a Part of the Farm Enkelbult 462 LQ near Lephalale, Lephalale Local Municipality, Waterberg District, Limpopo Province.

Heritage Impact Assessment

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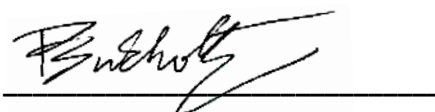
Declaration of Independence

This report has been compiled by PGS Heritage, an appointed Heritage Specialist for Synergistics Environmental Services. 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	Heritage Impact Assessment for the proposed development of the Grootegeeluk Mine construction camp for the Market Coke and Co-Generation Plant Project on a Part of the Farm Enkelbult 462 LQ near Lephalale, Lephalale Local Municipality, Waterberg District, Limpopo Province.		
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EXPLANATION OF ABBREVIATIONS USED IN THIS DOCUMENT

<i>Abbreviations</i>	<i>Description</i>
AIA	Archaeological Impact Assessment
ASAPA	Association of Southern African Professional Archaeologists
CMP	Conservation Management Plan
CRM	Cultural Resource Management
EIA	Environmental Impact Assessment
EMPR	Environmental Management Programme Report
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LIA	Late Iron Age
LSA	Later Stone Age
MSA	Middle Stone Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PGS	PGS Heritage
PHRA	Provincial Heritage Resources Authority
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

EXECUTIVE SUMMARY

PGS Heritage was appointed by Synergistics Environmental Services to undertake a Heritage Impact Assessment (HIA) which forms part of the Environmental Impact Assessment (EIA) for the proposed development of the Grootegeluk Mine construction camp for the Market Coke and Co-Generation Plant Project on a Part of the Farm Enkelbult 462 LQ, approximately 20km west of Lephalale, Lephalale Local Municipality, Waterberg District, Limpopo Province.

An archival and historical desktop study was undertaken which was used to compile a historical layering of the study area within its regional context. This component indicated that the landscape within which the project area is located has a rich and diverse history. However, the desktop study did not reveal any historic or heritage sites from within the study area.

A Palaeontological desktop study was performed by Dr. G. Groenewald. The study area is underlain by Jurassic aged basalt of the Letaba Formation of the Karoo Supergroup. Due to the igneous character of the rocks it is unlikely that it will contain fossils. The following recommendation is applicable:

- It is unlikely that the rock units underlying the study area will contain fossils and it is recommended that no further palaeontological investigations will be required.

The desktop studies were followed by a fieldwork component which comprised a walkthrough of the study area. No heritage sites were identified within the study area.

The development is not expected to have any impact on heritage sites. As such no heritage reasons can be given for the development not to continue.

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1 INTRODUCTION

PGS Heritage was appointed by Synergistics Environmental Services to undertake a Heritage Impact Assessment (HIA) which forms part of the Environmental Impact Assessment (EIA) for the proposed development of the Grootegeluk Mine construction camp for the Market Coke and Co-Generation Plant Project on a Portion of the Farm Enkelbult 462 LQ near Lephalale, Lephalale Local Municipality, Waterberg District, Limpopo 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 (HIA) aims to inform the Environmental Impact Assessment (EIA) in the development of a comprehensive Environmental Management Plan (EMP) to assist the developer in managing the identified 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 Assessment was compiled by PGS Heritage, the staff of which has a combined experience of nearly 40 years in the heritage consulting industry and have extensive experience in managing Heritage Impact Assessment (HIA) processes.

Mr. Polke Birkholtz, project manager and heritage specialist, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a professional archaeologist and is also a registered member of the Cultural Resource Management (CRM) Section of ASAPA. He has more than 15 years of experience in the industry. Mr. Marko Hutten, heritage specialist and project archaeologist, has 15 years of experience in the industry and is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited as a Field Director.

Dr Gideon Groenewald has 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 sites located during the fieldwork do not necessarily represent all the heritage sites present within the area. Should any heritage features or objects not included in the 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.

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. Minerals 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 Impacts Assessment (EIA) – Section (32)(2)(d)
 - d. EMP (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. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
 - a. Section 39(3)

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 NEMA (No 107 of 1998) states that an integrated EMP should (23:2 (b)) “...identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage”. In accordance with legislative requirements and EIA rating criteria, the regulations of SAHRA and ASAPA have also been incorporated to ensure that a comprehensive and legally compatible HIA report is compiled.

1.5 Terminology and Abbreviations

Archaeological resources

- 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 a 10m buffer area;
- 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 according to the heritage agency result in a change to the nature, appearance or physical nature of a place or influence its stability & 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

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

Later 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 ironworking and farming activities such as herding and agriculture.

Middle Stone Age

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

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past and any site which contains such fossilised remains or trace.

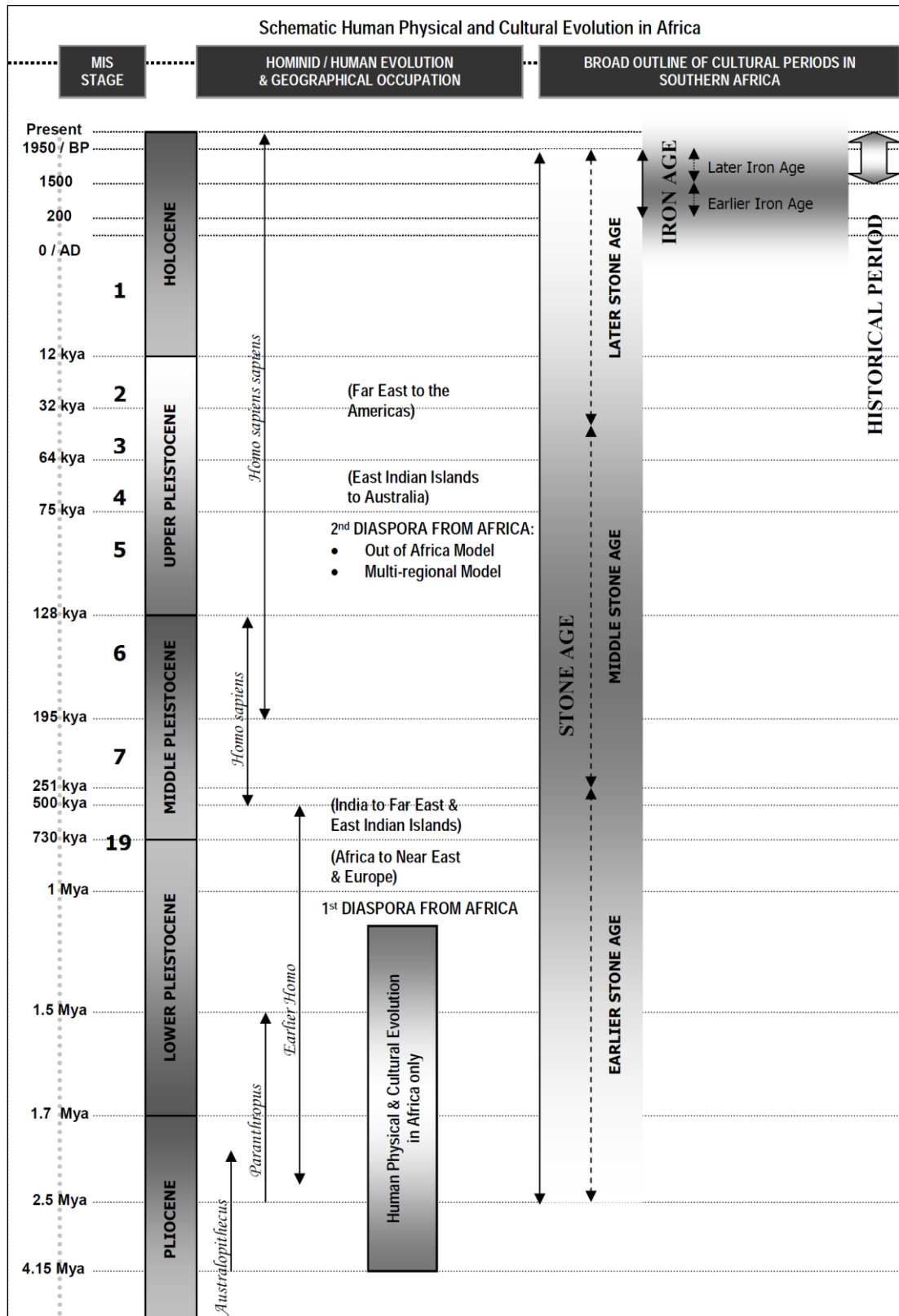


Figure 1 – Human and Cultural Time line in Africa (Morris, 2008)

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location and Description

Coordinates	East: S23° 39' 07.8" E27° 34' 12.7" South: S23° 39' 15.3" E27° 34' 10.1" West: S23° 39' 04.0" E27° 33' 55.8" North: S23° 39' 02.5" E27° 33' 57.4"
Property	A Portion of the Farm Enkelbult 462 LQ.
Location	The proposed development area is located west of Lephalale, Lephalale Local Municipality, Limpopo Province. The proposed development is situated adjacent to and on the north-eastern side of the D2001 tar road and is located across from the Grootegeluk Mine on mine property. A conveyor belt defines the western and northern boundaries of the site. A power line is situated along the eastern boundary and the D2001 tar road forms its southern boundary.
Extent	The study area is approximately 9 hectares in extent.
Land Description	The site is largely undisturbed except for its fringe areas where the development of the conveyor belt, road and power line occurred. An old disused gravel road passes through a section of the study area. The study area is largely flat and its vegetation cover comprises vegetation typical of the Western Bushveld.

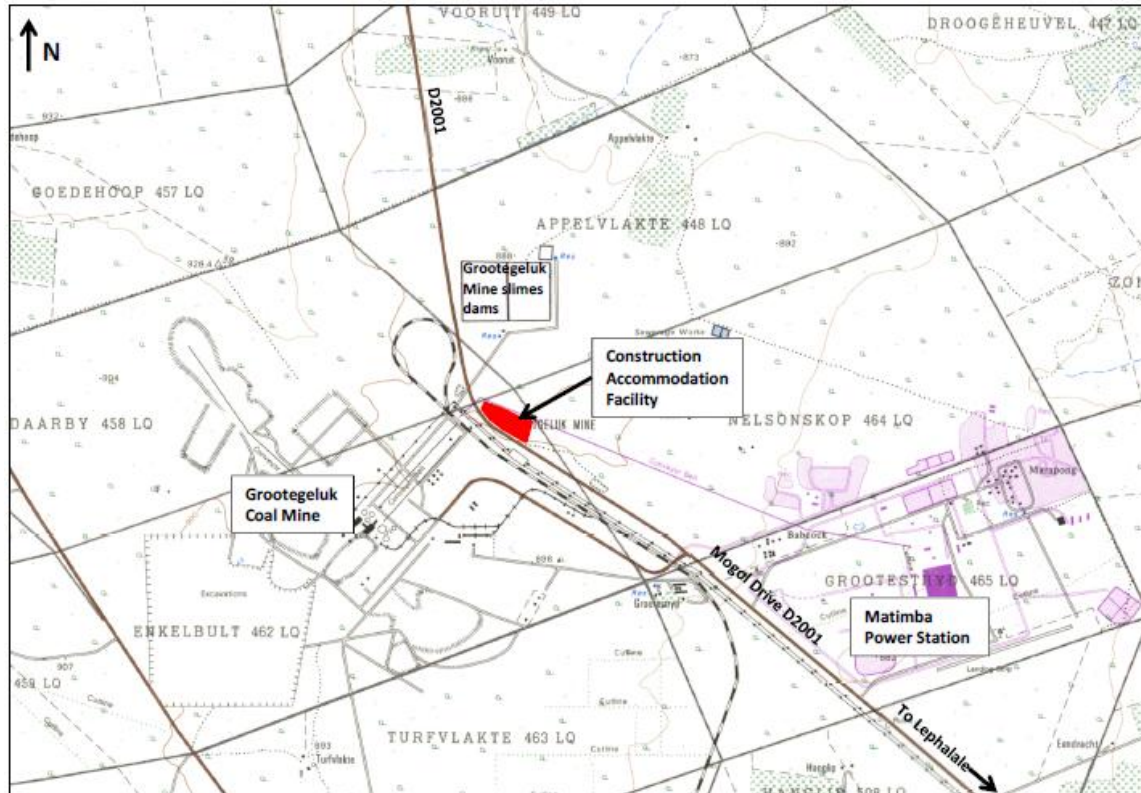


Figure 2 – The proposed development within the context of the Grootegeluk Mine and the Matimba Power Station. Map supplied by client.

2.2 Technical Project Description

Exxaro Resources Ltd (Exxaro) proposed the development of the Grootegeluk Mine Construction Camp for the Market Coke and Co-Generation Plant Project on a Portion of the Farm Enkelbult 462 LQ near Lephalale, Lephalale Local Municipality, Waterberg District, Limpopo Province.

The accommodation facility will house construction workers who will be erecting the Market Coke and Co-Generation Plant at the Grootegeluk Coal Mine. To enable the construction of the plant to be completed to the required level of accuracy, technical specifications and budget requirements, an enquiry document was issued to the open market worldwide in 2012. After the tender adjudication, two shortlisted tenderers were chosen, both of whom are from China. As the construction of the coke ovens requires skills which are currently only available in China, the tenderers indicated that they will need to bring the skilled workers from China. For this reason, a Construction Accommodation Facility is proposed to be built near the construction site on the property of Grootegeluk Coal Mine to house these construction workers.

At the peak period of construction the number of workers on site will be 500 to 600 people. The proposed Construction Accommodation Facility will consist of temporary housing which will be constructed by the successful tenderer. The camp will consist of prefabricated buildings. These buildings will be erected to meet the requirements of the construction workers and will include: sleeping quarters, dining areas, kitchens, ablutions and stores. Some of the buildings in the Construction Accommodation Facility will be two stories high. Gravel roads (4- 6 m wide) will be developed at the site. Exxaro will supply potable water, electricity, waste removal and sewage services to the Construction Accommodation Facility from the existing supplies at the Grootegeluk Coal Mine. Once construction of the coke ovens for the Market Coke and Co-Generation Plant Project are complete, the accommodation facility will remain on site for use in future construction projects. The site has indigenous vegetation which will need to be cleared for the construction of the facility. The area to be cleared will be kept to a minimum.

No layout plan or technical plans of the proposed development was available by the time of writing of this report.

3 ASSESSMENT METHODOLOGY

3.1 Methodology for Assessing Heritage Site Significance

This report was compiled by PGS Heritage for proposed mining activities. The applicable maps, tables and figures are included as stipulated in the NHRA (no 25 of 1999) and the National Environmental Management Act (NEMA) (no 107 of 1998). The HIA process consisted of three steps:

Step I – Desktop Study: The background information to the field survey leans greatly on the archival and historical cartographic material assessed as part of the study as well as a study of the available literature. The desktop study also included a detailed historical overview of the study area and surrounding landscape as well as a palaeontological desktop study.

Step II – Field Survey: Physical field surveys comprising intensive walkthroughs of the proposed footprint areas was conducted on Wednesday, 22 January 2014. The fieldwork was undertaken by a team comprising a professional archaeologist (Marko Hutten) and field assistant (Thomas Mulaudzi).

Step III – Report: The final step involved the recording and documentation of relevant heritage resources, as well as the assessment of resources regarding the heritage impact assessment criteria and report writing, as well as mapping and recommendations.

The significance of heritage sites was based on five 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 position

D - Preserve site, or extensive data collection and mapping of the site; and

E - Preserve site

Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report (see **Table 1**).

Table 1: 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	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High/Medium	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium	Recording before destruction
Generally Protected C (GP.C)	Grade 4D	Low	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 2**.

Table 2: Quantitative rating and equivalent descriptors for the impact assessment criteria

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	<i>Isolated corridor / proposed corridor</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.

Significance Assessment

The 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, 10 structures younger than 60 years might be affected by a proposed development, and if destroyed the impact can be considered as VERY LOW in that the structures are all of Low Heritage Significance. If two of the structures are older than 60 years and of historic significance, and as a result of High Heritage Significance, the impact will be considered to be HIGH to VERY HIGH.

A more detailed description of the impact significance rating scale is given in **Table 3** below.

Table 3: 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.

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 4**.

Table 4: Description of the spatial 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 possible impacts, 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 / corridor.
3	Local	The impact will affect an area up to 5 km from the proposed site.
2	Study Area	The impact will affect an area not exceeding the boundary of the study area.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the site.

Temporal/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 or duration scale is rated according to criteria set out in **Table 5**.

Table 5: 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 of the project.
5	Permanent	The environmental impact will be permanent.

Degree of Probability

The probability or likelihood of an impact occurring will be outlined in **Table 6** below.

Table 6: 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

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 7**. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making.

Table 7: 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.

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:

Impact Risk = (SIGNIFICANCE +Spatial+ Temporal) X Probability

3

5

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

Table 8: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Low	Local	Medium Term	Could Happen	Low
Impact on heritage structures	2	3	3	3	1.6

Note: The significance, spatial and temporal scales are added to give a total of 8, which 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 five classes as described in the table below.

Table 9: 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 heritage structures above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

4 CURRENT STATUS QUO

4.1 Description of Study Area

The study area is situated adjacent to and on the north-eastern side of the D2001 tar road (refer Figure 4) and is approximately 9 hectares in extent. It is located across from the Grootegeluk Mine and on mine property. A conveyor belt defines the western and northern boundaries of the site (Figure 5). A power line is located along the eastern boundary (refer Figure 6) and the D2001 tar road form the southern boundary of the site.

The site was largely undisturbed except for the areas on the fringes where the development of the conveyor belt, road and power line occurred. An old disused gravel road (refer Figure 8) also passed through a section of the proposed site.

It is characterized by vegetation in the form of grass and trees typical of the Western Bushveld (refer Figure 9).



Figure 3 – Google Earth image of the study area.



Figure 4 – View of the D2001 tar road as seen from the study area.



Figure 5 – View of the conveyor belt to the west and north of the study area.



Figure 6 – View of the power line at the eastern boundary of the study area.



Figure 7 – View of the fence on the boundary of the study area.



Figure 8 – View of the old road crossing through the study area.



Figure 9 – General view of the vegetation observed within the study area.

5 DESKTOP STUDY FINDINGS

5.1 Archival and Historic Maps of the Study Area and Surrounding Landscape

5.1.1 “Palala Mouth” Sheet of the Transvaal and Orange River Map Series

A section of the “Palala Mouth” sheet from the Transvaal and Orange River Map Series is depicted below (National Archives, Maps, 2/207). It was drawn in the Surveyor-General’s Office in Pretoria on 1 April 1911 and was compiled from the Farm Surveys of the Transvaal and other available information. The following observations can be made from the map:

- No heritage sites or features are depicted within or near the study area on the map.
- No mining activities are evident from within the farm or surrounding landscape.
- The colouration used to demarcate the farm Enkelbult (and surrounding farms) indicates that at the time it was unproclaimed government land.

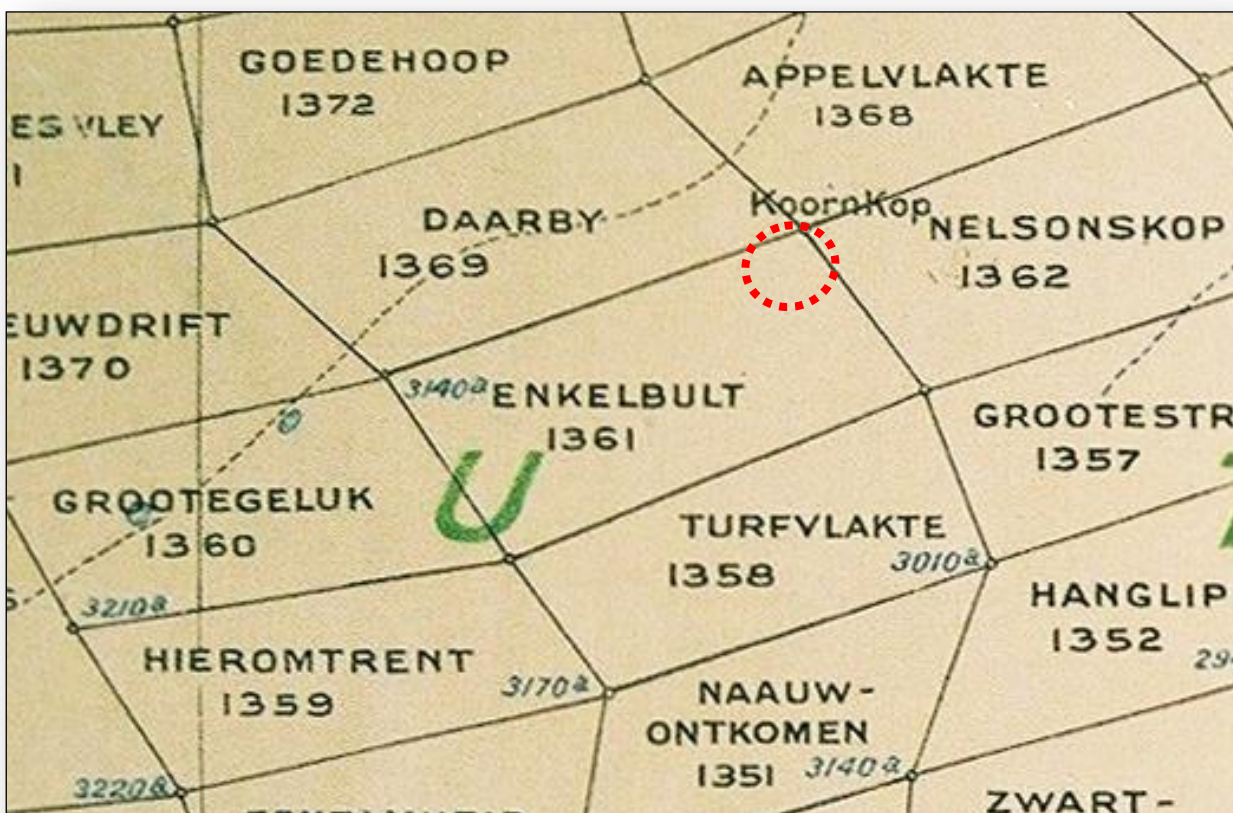


Figure 10 – Detail view of the “Palala Mouth” sheet of the Transvaal and Orange River Series which dates to 1 April 1911. The approximate position of the study area is shown in red.

5.1.2 First Edition of the 2327DA Topographical Sheet

A portion of the First Edition of the 2327DA Topographical Sheet is depicted below. The map was based on aerial photography undertaken in 1965 and was surveyed in 1969 and drawn in 1970 by the Trigonometrical Survey Office.

The following observations can be made from the map:

- No heritage sites or features are depicted within or near the study area on the map. Within the entire farm the only features which can be identified are two buildings of which one may have been the Enkelbult farmstead. However, these buildings are located well away from the present development area.
- No mining or associated infrastructural development had yet taken place within the farm.

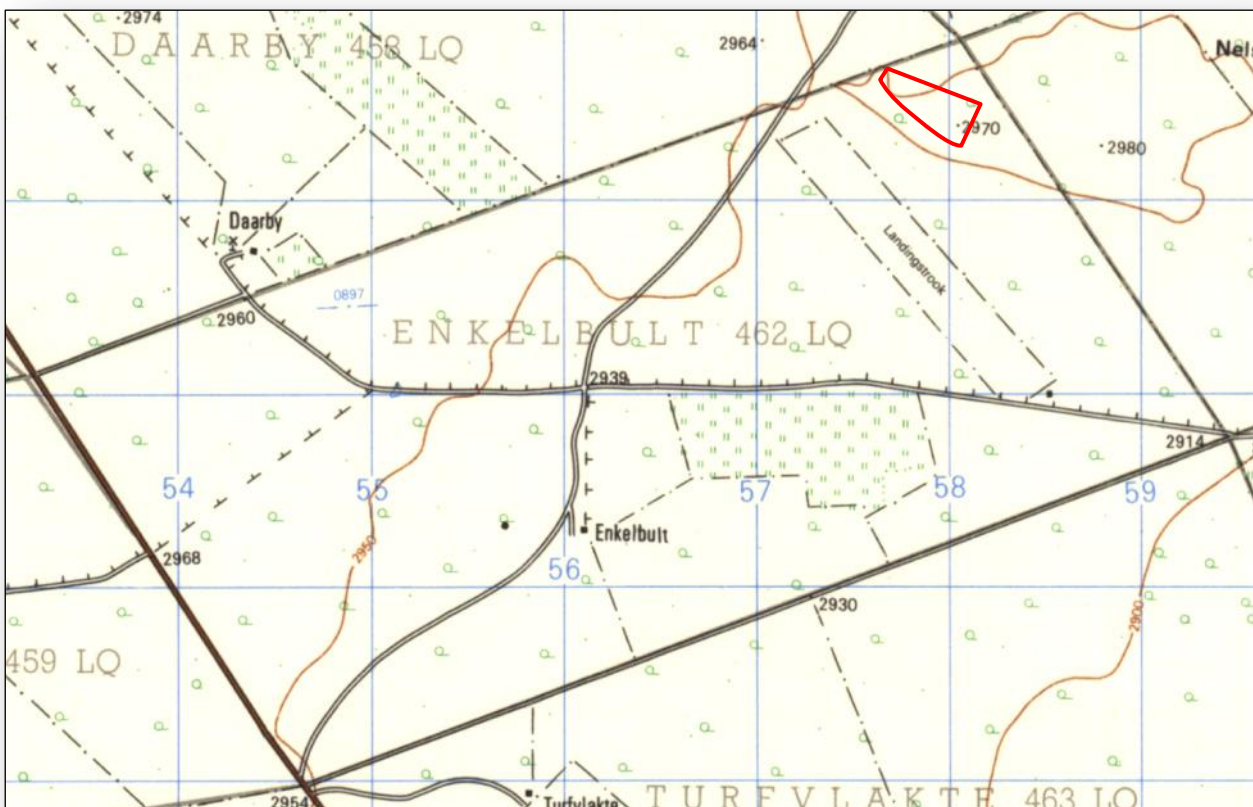


Figure 11 – Portion of the First Edition of the 2327DA Topographical Sheet that was surveyed in 1969. The farm Enkelbult 462 LQ is depicted and the position of the study area is shown in red.

5.1.3 Second Edition of the 2327DA Topographical Sheet

A portion of the Second Edition of the 2327DA Topographical Sheet is depicted below. The map was originally compiled in 1980, with additions made in purple from the 1990 aerial photograph.

The following observations can be made from the map:

- No heritage sites or features are depicted within or near the study area on the map.
- A significant amount of mining and associated infrastructural development has taken place within the farm and surrounding landscape between 1969 and 1981.
- The tar road on the southern and south-western end of the study area was built between 1969 and 1981. The conveyor belt on the northern and north-western ends of the study area was built between 1981 and 1990.

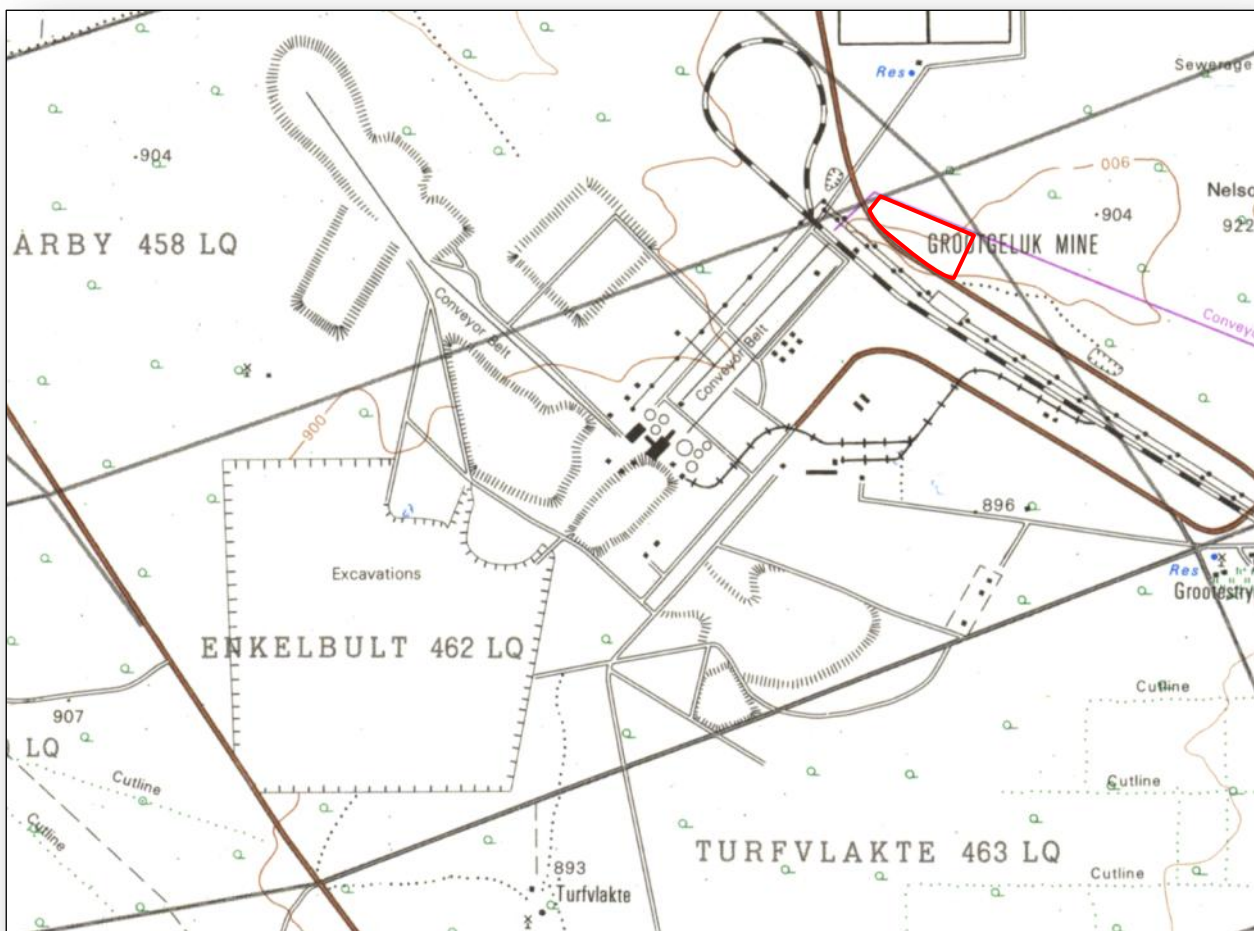


Figure 12 – Portion of the Second Edition of the 2327DA Topographical Sheet that was originally compiled in 1981 with additions in purple from an aerial photograph that was taken in 1990. The farm Enkelbult 462 LQ is depicted and the position of the study area is shown in red.

5.2 Historic Overview of Study Area and Surrounding Landscape

DATE	DESCRIPTION
2.5 million to 250 000 years ago	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 is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago.
250 000 to 40 000 years ago	<p>The Middle Stone Age (MSA) is the second oldest phase identified in South Africa's archaeological history. This phase is associated with flakes, points and blades manufactured by means of the so-called 'prepared core' technique.</p> <p>A number of MSA sites are known from the surroundings of the study area, many of which were identified during previous heritage and archaeological studies. For example, a total of 11 MSA sites were identified in an area roughly 20km north-west of the study area (Huffman & Van der Walt, 2013). Furthermore, a total of seven MSA sites were identified in an area roughly 5.8km north-west of the study area. For the most part these latter sites comprise findspots consisting of one or two lithics (Higgitt et. al., 2013).</p>
40 000 years ago to the historic past	<p>The Later Stone Age is the third archaeological phase identified and is associated with an abundance of very small artefacts known as microliths. This period in human history can also be associated with rock art in the form of engravings and paintings.</p> <p>Nelson's Kop, a hill situated 1.6km to the east of the present study area is a rock engraving site comprising cupules, animal spoor and incisions (Van Schalkwyk, 2005).</p>
AD 150 – AD 650	The Bambata facies of the Benfica Sub-Branch of the Kalundu Ceramic Tradition represents the earliest known Iron Age period within the surroundings of the study area. The decoration on the ceramics from this facies is characterised by " <i>...fine decoration, multiple bands and cross-hatching on long rim, alternating blocks of stamped and incised lines in neck.</i> " (Huffman, 2007:215).
AD 500 – AD 750	The Happy Rest facies of the Happy Rest Sub-Branch of the Kalundu Ceramic Tradition represents the second known Iron Age period within the surroundings of the study area. The decoration on the ceramics from this facies is characterised by " <i>...thickened rim, multiple bands of mixed decoration techniques, ladder stamping.</i> " (Huffman, 2007:221).
AD 750 – AD 1000	The Diamant facies of the Kalundu Ceramic Tradition represents the third known Iron Age period within the surroundings of the study area. The decoration on the ceramics from this facies is characterised by " <i>...tapered rims with broadly incised herringbone.</i> " (Huffman, 2007:225).
AD 1000 – AD 1300	The Eiland facies of the Kalundu Ceramic Tradition represents the fourth known Iron Age period within the surroundings of the study area. The

	decoration on the ceramics from this facies is characterised by “... <i>fine herringbone with stamping.</i> ” (Huffman, 2007:221).
AD 1500 – AD 1700	The Madikwe facies of the Moloko Branch of the Urewe Ceramic Tradition represents the fifth known Iron Age period within the surroundings of the study area. The decoration on the ceramics from this facies is characterised by “... <i>multiple bands of cord impressions, incisions, stabs and punctates separated by colour.</i> ” (Huffman, 2007:201).
AD 1550 – AD 1750	<p>The Letsibogo facies of the Moloko Branch of the Urewe Ceramic Tradition represents the sixth known Iron Age period within the surroundings of the study area. The decoration on the ceramics from this facies is characterised by “...<i>lines of punctuates separating black and red zones.</i>” (Huffman, 2007:189).</p> <p>For example, Letsibogo sites were identified in an area roughly 20km north-west of the study area (Huffman & Van der Walt, 2013).</p>
1836	The first Voortrekker parties started crossing the Vaal River (Bergh, 1999).
1840s	These years saw the first arrival of Voortrekkers in the general vicinity of the study area (Bergh, 1999). However, the establishment of farms by the Voortrekkers in the direct vicinity of the study area appears to have been isolated and sporadic during these early years with some settlement only taking place during the 1870s. The presence of tsetse fly across cast sections of present-day Limpopo Province represented a significant hindrance to the permanent settlement of Voortrekkers in this area.
1848	The area that was later to be known as the district of Soutpansberg was established in this year (Bergh, 1999). The study area fell within this area at the time.
1866	The study area now fell within the Waterberg District of the Zuid-Afrikaansche Republiek (Bergh, 1999). The study area remained within this district until c. 1990 when the Ellisras District was established.
1920	In this year F.F. Pienaar applied for permission to peg 50 claims each on the farms Kringgatspruit, Hooikraal, Grootegeeluk and Enkelbult (National Archives, MNW, 535, MM1713/20).
1920s	Coal was first discovered in the vicinity of Lephalale during drilling activities for water (Erasmus, 2004).
1941 - 1952	Exploration activities during this time revealed vast reserves of medium grade coal in the vicinity of where Ellisras (present-day Lephalale) would later be established (Lang, 1995).
December 1960	The town of Ellisras was laid out on the farm Waterkloof. The name of the town was derived from the two owners of the farm at the time, namely Patrick Ellis and Piet Erasmus (Erasmus, 2004).
1973	Iscor commenced with extensive exploration activities in proximity to the study area which located “... <i>exploitable measures estimated at around two billion tons, of which 500 million was classified as blend coking coal.</i> ” (Lang,

	1995:184).
1975	A box cut was developed on the farm Enkelbult 462 LQ to mine approximately 30 000 ms of coal bearing shale during early 1975 (South African Mining and Engineering Journal, 1978). The box cut produced approximately 1500 tons of metallurgical coal as well as a large volume of midlings for large-scale testing at Iscor's Pretoria and Vanderbijlpark works. Following on successful tests an opencast operation was started during the latter part of 1975. Activities slowed down shortly thereafter due to the economic climate and the financial problems faced by Iscor at the time (Rand Daily Mail, 1977).
1980	The Grootegeluk Mine commenced production during this year (Mining Mirror, 2007). The residential areas of Onverwacht and Marapong for white and black staff members respectively appear to have been established at roughly the same time (The Finweek, 1980). Marapong is situated approximately 4.5km east and Onverwacht some 10.5km south-east of the study area.
1986	The town of Ellisras received municipal status in this year (Erasmus, 2004).
2002	The name of the town of Ellisras was changed to Lephalale (Erasmus, 2004).

5.3 Previous Archaeological and Heritage Studies in and around the Study Area

An electronic web search was undertaken and relevant archaeological and historical texts were also consulted. In this regard, the South African Heritage Resources Information System (SAHRIS) was especially helpful (see <http://www.sahra.org.za/sahris>).

A large number of previous archaeological and heritage studies had been undertaken in the surroundings and general vicinity of the present study area, with many of these studies undertaken for proposed coal mining or related activities. None of these studies appear to include the present study area within their respective scope of works. Furthermore, none of these studies indicate the presence of known heritage sites within the study area. The two closest previous studies to the present study area appear to have been the heritage survey undertaken by Dr. J. van Schalkwyk of the Kumba Properties at the Grootegeluk Mine (Van Schalkwyk, 2005) as well as the Heritage Impact Assessment Report undertaken by Dr. J. van Schalkwyk for the proposed establishment of the Exxaro PV Plant on the farm Nelsonskop (Van Schalkwyk, 2011'). While the latter study included an assessment of proposed power line and access roads passing directly north-east of the present study area, the former study may have included the present study area as well.

A number of heritage sites were identified in the vicinity of the present study area. The closest identified site to the present study area that could be found in these previous studies is a rock art site located at Nelson's Kop, which is roughly 1.7km north-east of the present study area. The site consists of a panel of rock engravings comprising cupules, cut marks and animal tracks and may have been used as a site of potency during both the Later Stone Age as well as Late Iron Age (Van Schalkwyk, 2005).

The heritage sites identified during the survey undertaken by Dr. J. van Schalkwyk of the Kumba Properties at the Grootegeluk Mine (Van Schalkwyk, 2005) provide a good understanding of the type of heritage sites found within the surroundings of the study area. He identified five sites in this area namely the Later Stone Age and Late Iron Age rock art site at Nelson's Kop referred to above, two cemeteries associated with local farms, a site consisting of non-diagnostic pottery as well as an historic headgear associated with early mining activities in the area. Furthermore, Van Schalkwyk also observed Middle Stone Age lithics associated with outcrops and pans in the study area. Incidentally, the Heritage Impact Assessment Report undertaken by Dr. J. van Schalkwyk for the proposed establishment of the Exxaro PV Plant on the farm Nelsonskop identified a single site, namely the rock art site at Nelson's Kop (Van Schalkwyk, 2011).

These sites are typical of the heritage sites identified during previous heritage studies undertaken in the surrounding landscape. For example, a heritage impact assessment undertaken for the Thabametsi Project roughly 6.5km to 15.2km north-west of the study area by Higget et. al. (2013) identified four Late Iron Age sites comprising findspots or low density surface scatters of non-diagnostic pottery, six Middle Stone Age findspots, one Stone Age surface scatter, two historical farmsteads and eight cemeteries. Similarly, an archaeological impact assessment undertaken by Dr. F. Roodt for the proposed development of a heavy industrial area on the farm Grootestryd 465 LQ (roughly 2.5km south-east of the study area) identified a number of Middle Stone Age flakes in disturbed contexts (Roodt, 2001).

A number of the previous archaeological and heritage studies refer to the fact that the Lephalale area was never intensively settled by communities. In this regard refer for example Van Schalkwyk (2005) and Van der Walt (2012). The reasons behind this lack of intensive human settlement are explained on the basis of climatic, geographical and biological conditions. The study area and surroundings for example are characterised by a landscape that is hot and very dry with limited availability for surface water. Furthermore, tsetse fly was found in the area

which would have curtailed any permanent settlement by communities for whom cattle farming were an important socio-economic activity. As a result Late Iron Age and Voortrekker communities would have preferred establishing themselves in other areas where the rigours of extreme climatic conditions, limited water sources as well as illnesses affecting their animals and livelihoods would have been less strenuous. As a result it is not surprising that a number of the previous archaeological and heritage surveys undertaken in the surroundings of the study area did not identify any heritage sites.

A list of some of the previous archaeological and heritage surveys from the surroundings of the present study area is provided below:

- Fourie, W. & van der Walt, J. 2006. *Heritage Impact Assessment: Paarl Eco Estate Portion 2 of the Farm Paarl 522 LQ, near Ellisras (Lephalale) in the Suburb of Onverwacht, Limpopo Province*. An unpublished report by Matakoma.
- Gaigher, S. 2007a. *Heritage Impact Assessment for the Proposed Ellisras Extension 67 Housing Project on the Farm Waterkloof 502 LQ, Limpopo*. An unpublished report by Archaeo-Info.
- Gaigher, S. 2007b. *Heritage Impact Assessment for the Proposed Ellisras Extension 66 Housing Project on the Farm Waterkloof 502 LQ, Limpopo Province*. An unpublished report by Archaeo-Info.
- Higget, N. 2012. *Phase 1 Archaeological Impact Assessment for the MBET Pipeline*. An unpublished report by Digby Wells Environmental.
- Higget, N. & S. Karodia. 2013. *Heritage Impact Assessment for the Proposed Thabametsi Project, Lephalale, Limpopo Province*. An unpublished report by Digby Wells.
- Huffman, T.N. & J. van der Walt. 2013. *Sasol Limpopo West Heritage Report*. An unpublished report by the University of the Witwatersrand.
- Roodt, F. 2001. *Archaeological Impact Assessment: Proposed Heavy Industrial Area on Portion 5 of the farm Grootestryd 465 LQ, Ellisras*. An unpublished report by R & R Cultural Resource Consultants.

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- Van Schalkwyk, J.A. 2005a. *Heritage Impact Scoping Report for the Proposed New Matimba B Power Station, Lephalale District, Limpopo Province*. An unpublished report by the National Cultural History Museum.
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- Van Vollenhoven, A.C. 2008a. *A Report on a Cultural Heritage Impact Assessment for the Proposed Housing Development at Erf 1522 Ellisras on the Farm Onverwacht 503 LQ, Lephalale, Limpopo Province*. An unpublished report by Archaetnos.
- Van Vollenhoven, A.C. 2008b. *A Report on a Cultural Heritage Impact Assessment for the Proposed Housing Development at Extension 88 and 90 Ellisras on the Farm Onverwacht 503 LQ, Lephalale, Limpopo Province*. An unpublished report by Archaetnos.
- Van Vollenhoven, A.C. 2008c. *A Report on a Cultural Heritage Impact Assessment for the Proposed Housing Development at Extension 89 Ellisras on the Farm Onverwacht 503 LQ, Lephalale, Limpopo Province*. An unpublished report by Archaetnos.

5.4 Palaeontological Desktop Study

5.4.1 Introduction

The following section is an extract from the Palaeontological study (refer Appendix B). The study area is underlain by Jurassic aged basalt of the Letaba Formation of the Karoo Supergroup. Due to the igneous character of the rocks it is unlikely to contain fossils (refer Figure 13).

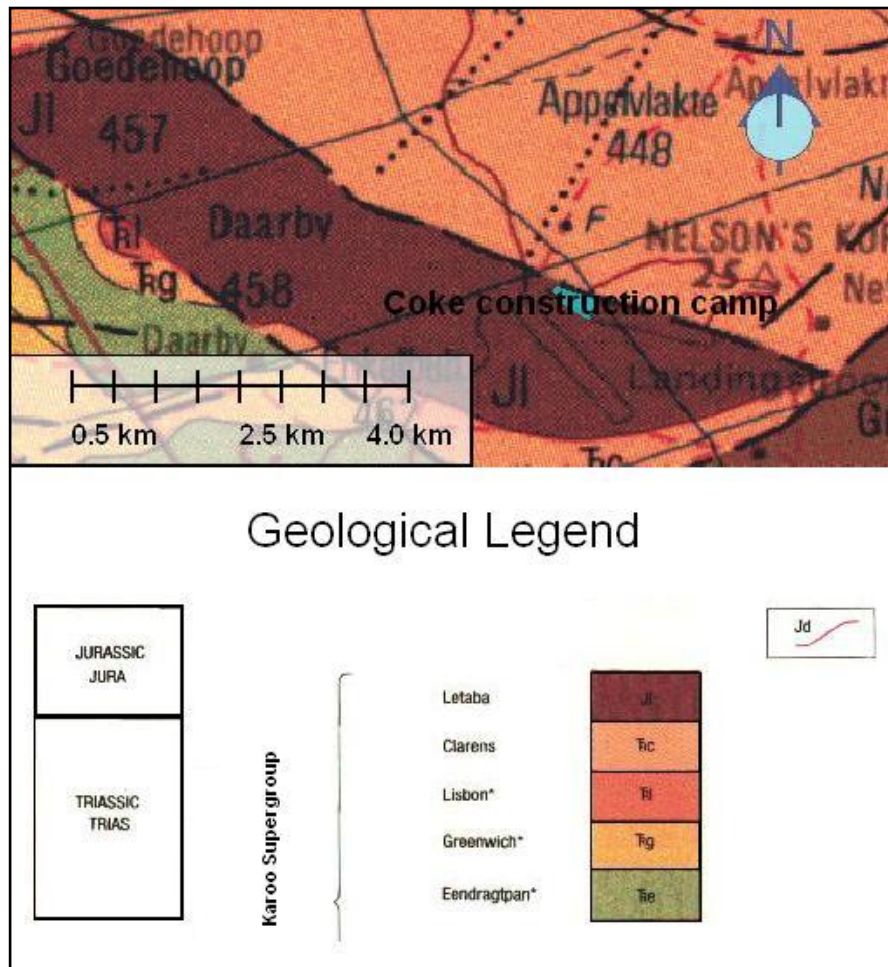


Figure 13 – Geological map of the study area.

5.4.2 Palaeontological Sensitivity

Due to the igneous nature of the rocks underlying the study area, it is unlikely that the rocks will contain fossils and a low palaeontological sensitivity is allocated to the site (refer Figure 14).

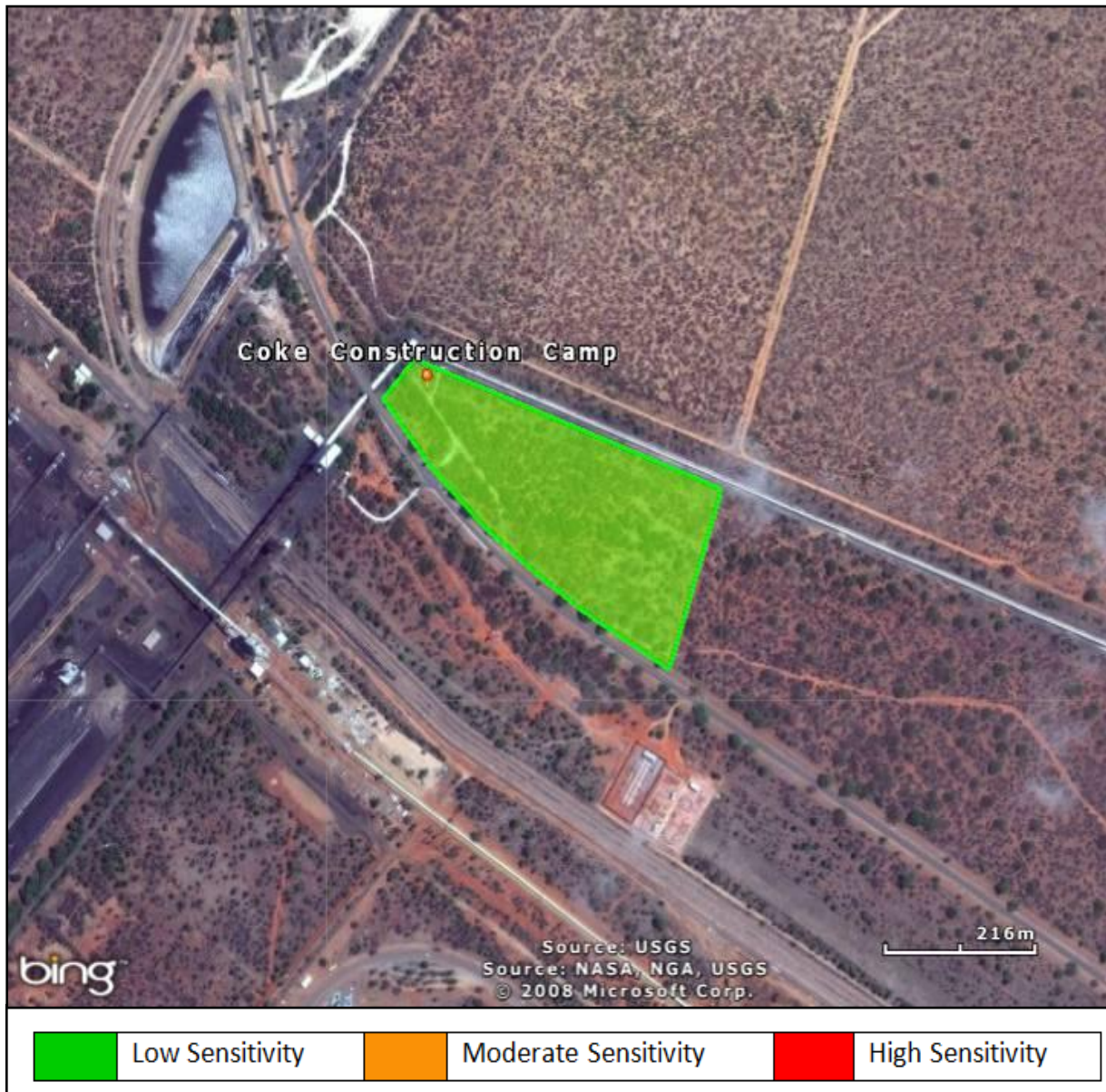


Figure 14 – Palaeontological Sensitivity Map

5.4.3 Conclusion and Recommendations

The study area is underlain by Jurassic aged basalt of the Letaba Formation of the Karoo Supergroup. The following recommendation is applicable:

- It is unlikely that the rock units underlying the study area will contain fossils and it is recommended that no further palaeontological investigations will be required.

6 FIELDWORK FINDINGS

A systematic walkthrough of the study area was undertaken by a fieldwork team comprising an archaeologist and a field assistant. Each member of the team carried a hand-held GPS, and their track logs are depicted on the image below.

No heritage sites were identified within the study area.



Figure 15 – Google Earth image depicting the study area boundaries in red as well as the recorded track logs in white.

7 IMPACT OF PROPOSED DEVELOPMENT ON HERITAGE RESOURCES

No heritage sites were identified within the study area. As a result the proposed development will not have any impact on the heritage fabric of the surrounding landscape.

8 MITIGATION MEASURES AND GENERAL RECOMMENDATIONS

No heritage sites were identified within the study area and as a result no further heritage mitigation measures are required.

9 CONCLUSIONS

PGS Heritage was appointed by Synergistics Environmental Services to undertake a Heritage Impact Assessment (HIA) which forms part of the Environmental Impact Assessment (EIA) for the proposed development of the Grootegeluk Mine construction camp for the Market Coke and Co-Generation Plant Project on a Part of the Farm Enkelbult 462 LQ, approximately 20km west of Lephalale, Lephalale Local Municipality, Waterberg District, Limpopo Province.

An archival and historical desktop study was undertaken which was used to compile a historical layering of the study area within its regional context. This component indicated that the landscape within which the project area is located has a rich and diverse history. However, the desktop study did not reveal any historic or heritage sites from within the study area.

A Palaeontological desktop study was performed by Dr. G. Groenewald. The study area is underlain by Jurassic aged basalt of the Letaba Formation of the Karoo Supergroup. Due to the igneous character of the rocks it is unlikely that it will contain fossils. The following recommendation is applicable:

- It is unlikely that the rock units underlying the study area will contain fossils and it is recommended that no further palaeontological investigations will be required.

The desktop studies were followed by a fieldwork component which comprised a walkthrough of the study area. No heritage sites were identified within the study area.

The development is not expected to have any impact on heritage sites. As such no heritage reasons can be given for the development not to continue.

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Archival References

National Archives, MNW, 535, MM1713/20

Historic Topographic Maps

The historic topographic maps used in this report were obtained from the Directorate: National Geo-spatial Information of the Department of Rural Development & Land Reform, Cape Town.

Google Earth

All the aerial depictions used in this report are from Google Earth.

LEGISLATIVE REQUIREMENTS – TERMINOLOGY AND ASSESSMENT CRITERIA

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 terms of the heritage legislation, permits are required to damage, destroy, alter, or disturb them. Furthermore, individuals who already possess heritage 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 located in a cemetery (such as ancestral graves in rural areas), are protected. The legislation also 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 resources 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 prehistoric cultural remains, including graves and human remains.

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 re-internment 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 Resources 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 administrated by a local authority. Graves in the category located inside a formal cemetery administrated 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 STUDY

**PALAEONTOLOGICAL DESKTOP
ASSESSMENT FOR THE PROPOSED
DEVELOPMENT OF THE COKE
CONSTRUCTION CAMP AT THE EXARRO
COAL MINE NEAR ELLISRAS, LIMPOPO
PROVINCE**

For:

HIA CONSULTANTS



DATE: 25 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 development of the proposed Coke Construction Camp/Chinese Camp as part of the Char expansion project of Exxaro Coal near the town of Ellisras in Limpopo Province.

This report forms part of the Environmental Impact Assessment 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), a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint of the mine extension.

The study area is located approximately 20km West of the town Ellisras in Limpopo Province. The project entails the development of a construction camp at the Exxaro Coal Mine.

The study area is underlain by Jurassic aged basalt of the Letaba Formation of the Karoo Supergroup. Due to the igneous character of the rocks it is unlikely that it will contain fossils.

Recommendation:

It is unlikely that the rock units underlying the study area will contain fossils and it is recommended that no further palaeontological investigations will be required.

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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 development of the proposed Coke Construction Camp/Chinese Camp as part of the Char expansion project of Exxaro Coal near the town of Ellisras in Limpopo Province.

This report forms part of the Environmental Impact Assessment 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), a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint of the mine extension.

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

2. DESCRIPTION OF THE PROPOSED DEVELOPMENT

The study area is located approximately 20km West of the town Ellisras in Limpopo Province. The project entails the development of a construction camp at the Exxaro Coal Mine (Figure 2.1).



Figure 2.1 Locality of the Coke Construction Camp

3. GEOLOGY

The study area is underlain by Jurassic Aged igneous rocks of the Letaba Formation, Karoo Supergroup. The basalt deposits of this formation were formed during the breakup of Gondwana (Johnson et al, 2006).

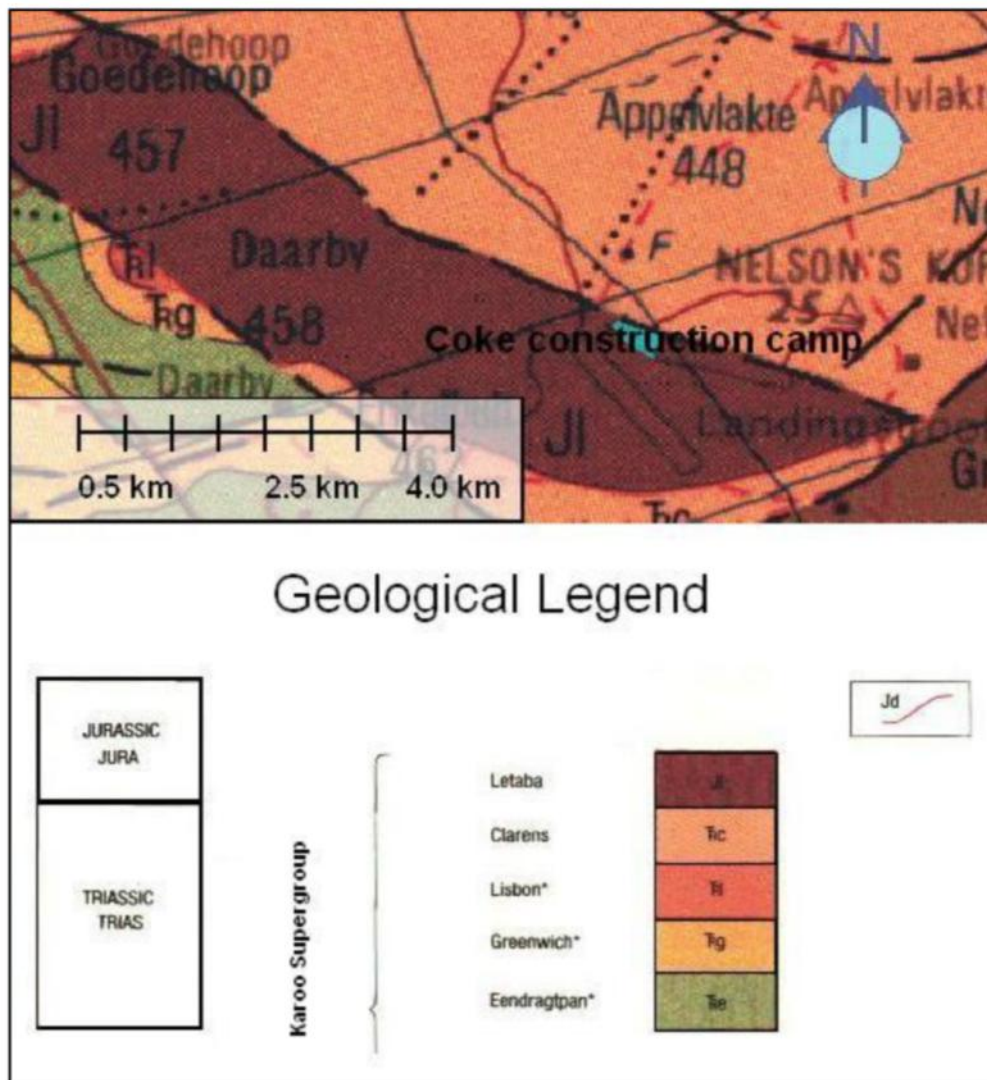


Figure 3.1 Geology of the study area

4. PALAEOLOGY OF THE AREA

Due to the igneous character of the Letaba Formation basalt underlying the study area, no fossils are expected at the site.

5. PALAEOLOGICAL SENSITIVITY

Due to the igneous nature of the rocks underlying the study area, it is unlikely that the rocks will contain fossils and a low palaeontological sensitivity is allocated to the site (Figure 5.1).

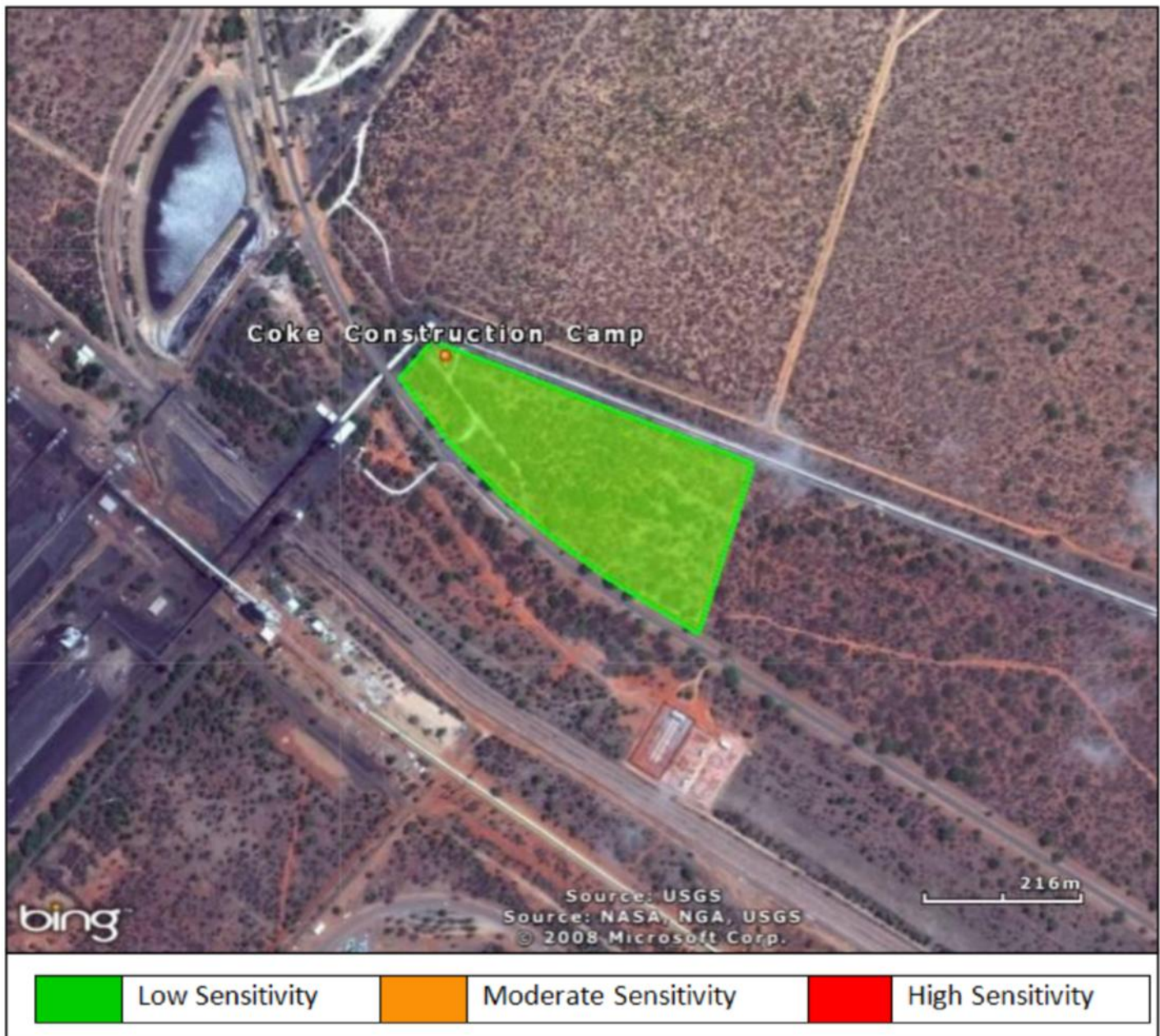


Figure 5.1 Due to the igneous character of the rocks underlying the PSA study area, a low palaeontological sensitivity rating is allocated to this development

6. CONCLUSION AND RECOMMENDATIONS

The study area is underlain by Jurassic aged basalt of the Letaba Formation of the Karoo Supergroup.

Recommendation:

It is unlikely that the rock units underlying the study area will contain fossils and it is recommended that no further palaeontological investigations will be required.

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 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 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.



Dr Gideon Groenewald
Geologist