



## **Appendix 6E**

### **Heritage Assessment**





## **SOUTH AFRICA MAINSTREAM RENEWABLE POWER DEVELOPMENTS (PTY) LTD**

---

# **Ithemba Wind Energy Facility (WEF) – 132kV Grid connection and substation**

## **Heritage Impact Report**

**Issue Date:** 28 July 2017  
**Revision No.:** 2 (20 February 2018)  
**Project No.:** 13622

<b>Date:</b>	20 02 2018
<b>Document Title:</b>	Heritage Impact Report – Ithemba WEF 132kV Grid Connection and substation
<b>Author:</b>	Wouter Fourie
<b>Revision Number:</b>	2
<b>Checked by:</b>	Andrea Gibb
<b>For:</b>	SiVEST Environmental Division

## Executive Summary

PGS was appointed by SiVEST Environmental Division (SiVEST) to undertake a Heritage Impact Assessment that forms part of the Basic Environmental Assessment Report and Environmental Management Plan for the Ithemba WEF 132kV grid connection and substation for South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream), near Loeriesfontein in the Northern Cape Province.

Heritage resources are unique and non-renewable and as such any impact on such resources must be seen as significant.

The background research completed in October 2016 has shown that the proposed Ithemba WEF grid connection and substation to be developed as a WEF may have heritage resources present on the property. This has been confirmed through archival research and evaluation of aerial photography of the sites.

The subsequent field work completed for the October 2016 and June 2017, has identified no heritage resources within any of the proposed alternative positions or alignments.

### 1.1 Impact and Cumulative Impact

***No heritage resources were identified during the field work on the corridor and substation options. The impact by the proposed development on heritage resources will be low to negligible.***

***It is my considered opinion that this additional load on the overall impact on heritage resources will have a low to negligible cumulative impact.***

**None of the alternatives are deemed to be unfavourable and all can be utilised from a heritage point of view.**

### 1.2 Mitigation

The design process and methodology followed by the developer for this project will enabled the heritage assessment to provide input into the proposed layouts. This resulted in cognisance being taken of the positions of the heritage resources and thus the reduction of impacts at an early design phase

The mitigation measures proposed is a follows:

### 1.3 Pre-Construction

1. A walk down of the final layout to determine if any significant sites will be affected.
2. Monitor find spot areas if construction is going to take place through them.
3. A management plan for the heritage resources needs then to be compiled and approved for implementation during construction and operations. Possible surface collections for sites with a medium to high significance as well as conducting a watching brief by heritage practitioner during the construction phase.

### 1.4 Palaeontology

According to the SAHRIS PlaeoMap the Dwyka Group has a low Palaeontological Sensitivity while the Ecca Group (Tierberg and Whitehill Formations) has a moderate palaeontological Sensitivity. But, the Palaeontological Sensitivity of the Prince Albert Formation is High. The Karoo Dolerite Suite consists of igneous rocks and are unfossiliferous. uaternary fossil assemblages are generally rare and low in diversity and occur over a wide-ranging geographic area. Due to the High Palaeontological sensitivity of the Prince Albert Formation (Ecca Group) a site visit is thus recommended.

Prior to construction a detailed palaeontology study will thus be conducted to assess the value and importance of fossils in the development area and the effect of the proposed development on the palaeontological heritage. This consists of a Phase 1 field-based assessment by a professional palaeontologist. The purpose of the detailed Report is to elaborate on the issues and potential impacts identified during the initial study undertaken for the Basic Assessment (BA). This is achieved by site visits and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the BA. The report will be submitted to SAHRA before the commencement of any development-related activities.

**MAINSTREAM RENEWABLE POWER DEVELOPMENTS (PTY) LTD**  
**HERITAGE IMPACT REPORT**

<b>Contents</b>	<b>Page</b>
<b>EXECUTIVE SUMMARY</b>	
1.1 Impact and Cumulative Impact	2
1.2 Mitigation	2
1.3 Pre-Construction	3
1.4 Palaeontology	3
<b>REPORT</b>	
1 INTRODUCTION .....	1
1.1 Scope of the Study	1
1.2 Assumptions and Limitations	1
1.3 Specialist Qualifications	1
1.4 Legislative Context	2
2 TECHNICAL DETAILS OF THE PROJECT .....	7
2.1 Project Location	7
2.2 Project Description	7
3 ASSESSMENT METHODOLOGY .....	9
3.1 Methodology for Assessing Heritage Site significance	9
4 BACKGROUND RESEARCH .....	10
4.1 Previous Studies	10
5 FIELD WORK FINDINGS.....	13
5.1 Methodology	13
5.2 Findings	13
6 IMPACT ASSESSMENT .....	15
6.1 Impact matrix	16
6.2 Confidence in Impact Assessment	19
6.3 Cumulative Impacts	19
6.4 Reversibility of Impacts	22
6.5 Assessment of alternatives	22
7 CONCLUSIONS AND RECOMMENDATIONS.....	24
7.1 Impact and Cumulative Impact	24
7.2 Mitigation	25
7.3 Pre-Construction	25
7.4 Palaeontology	25
8 REFERENCES.....	26

## **Appendices**

- A: LEGISLATIVE PRINCIPLES
- B: HERITAGE IMPACT ASSESSMENT METHODOLOGY
- C: IMPACT ASSESSMENT MATRIX
- D: PALAEONTOLOGICAL DESKTOP ASSESSMENT



# **1 INTRODUCTION**

PGS Heritage (Pty) Ltd was appointed by SiVEST Environmental Division to undertake a Heritage Impact that forms part of the basic Environmental Assessment Report (BAR) and Environmental Management Plan (EMP) for the Ithemba Wind Energy 132kV grid connection and substation for South Africa Mainstream Renewable Power Developments (Pty) Ltd, near Loeriesfontein in the Northern Cape Province.

## **1.1 Scope of the Study**

The aim of the study is to identify possible heritage resources, finds and sensitive areas that may occur in the study area 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 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 development area. Various factors account for this, including the subterranean nature of some archaeological sites. 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.

## **1.3 Specialist Qualifications**

PGS Heritage (PGS) compiled this HIA.

The staff at PGS has a combined experience of nearly 80 years in the heritage consulting industry. PGS and its staff have extensive experience in managing the HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Wouter Fourie, author and project manager for this project, is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA) and has CRM accreditation within the said organisation, as well as being accredited as a Professional Heritage Practitioner with the Association of Professional Heritage Practitioners – Western Cape (APHP)

Jessica Angel holds a Masters degree in Archaeology and is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA).

Marko Hutten, heritage specialist and project archaeologist, has 18 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.

## 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:

- National Environmental Management Act (NEMA), Act 107 of 1998
- National Heritage Resources Act (NHRA), Act 25 of 1999
- Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002

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

- 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)
- 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
- Mineral and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
- 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 NHRA is utilised 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 and MPRDA 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.

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).

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

**Table 1: Terminology**

<b>Acronyms</b>	<b>Description</b>
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
BAR	Basic Environmental Impact Assessment Report
CI	Cumulative Impacts
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Earlier Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Later 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 Agency
PSSA	Palaeontological Society of South Africa
ROD	Record of Decision
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
WEF	Wind Energy Facility

#### *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

#### *Earlier 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, such as the caves with archaeological deposits identified close to both development sites for this study.

#### *Holocene*

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

#### *Later Stone Age*

The archaeology of the last 30 000 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 30 000-300 000 years ago, associated with early modern humans.

#### *Palaeontology*

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

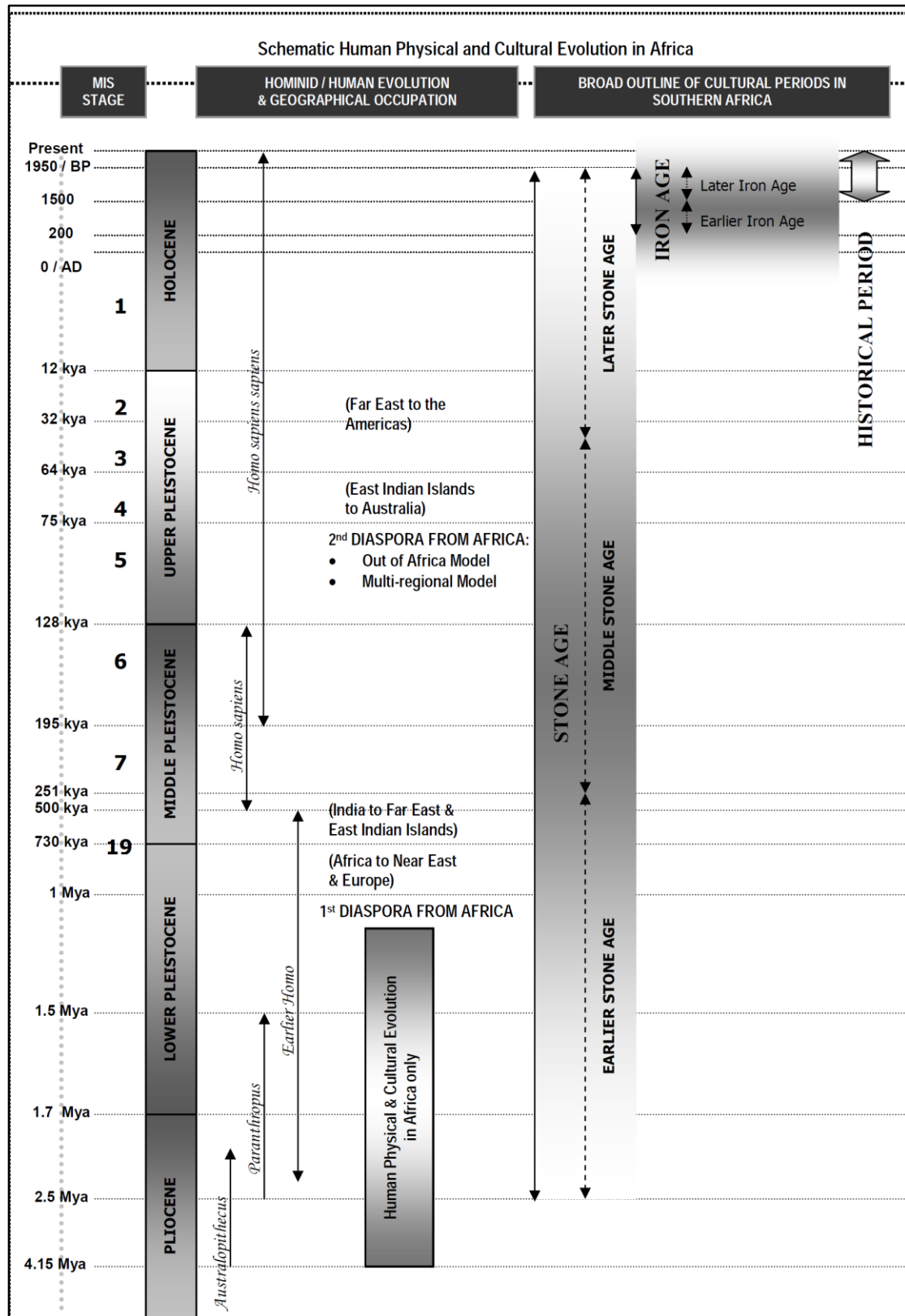


Figure 1: Human and Cultural Timeline in Africa (Morris, 2008)

## 2 TECHNICAL DETAILS OF THE PROJECT

### 2.1 Project Location

South Africa Mainstream Renewable Power Developments (Pty) Ltd (hereafter referred to as Mainstream) are proposing to construct a 33kV/132kV on-site substation, namely the Ithemba Substation, a 132kV Linking Substation and an associated 132kV power line near Loeriesfontein in the Northern Cape Province (hereafter referred to as the 'proposed development'). The proposed development is aimed at feeding electricity generated by Mainstream's proposed Ithemba Wind Farm (part of separate on-going EIA process) into the national grid.

### 2.2 Project Description

At this stage, it is understood that the proposed development will include a 33kV/132kV on-site IPP substation (namely Ithemba Substation), as well as a 132kV Linking Substation and a 132kV power line. The aim of this development is to feed electricity generated by the proposed Ithemba Wind Farm (part of separate on-going EIA process) into the national grid.

The proposed development will include the following main activities:

- Construction of 1 x 33kV/132kV substation (referred to as the "proposed Ithemba Substation")
- Construction of 1 x 132kV linking substation
- Construction of 1 x 132kV power line from the proposed Ithemba Substation, via the proposed Linking Substation to Helios substation, approximately 34km south-east of the proposed Ithemba Wind Farm.

The size of the proposed on-site substation site will be approximately 500m x 300m, while the Linking Substation site will be approximately 600m x 600m. A power line corridor of between 100m and 500m wide is being proposed to allow flexibility when determining the final route alignment. The proposed power line however only requires a 31m wide servitude and as such, this servitude would be positioned within the corridor.

It should be noted that two (2) alternative sites for the proposed on-site Ithemba Substation and the proposed Linking Substation have been assessed during the Basic Assessment (BA), in conjunction with four (4) power line corridor alternatives.

The proposed power line will include a series of towers located approximately 170m to 250m apart. The type of towers being considered at this stage include self-supporting suspension monopole structures (**Figure 2**) for relatively straight sections of the line and angle strain towers where the line bends to a significant degree. The steel monopole tower type is between 18 and 25m in height, depending on the terrain, but will ensure minimum overhead line clearances from buildings and surrounding infrastructure. The exact location of the towers will be determined during the final design stages of the power line.



**Figure 2: Tower Type**

The proposed Ithemba Wind Farm (part of a separate on-going EIA process) application site, proposed Ithemba Substation site and associated 132kV power line corridor route alternatives are shown in the locality map below (**Figure 3**).



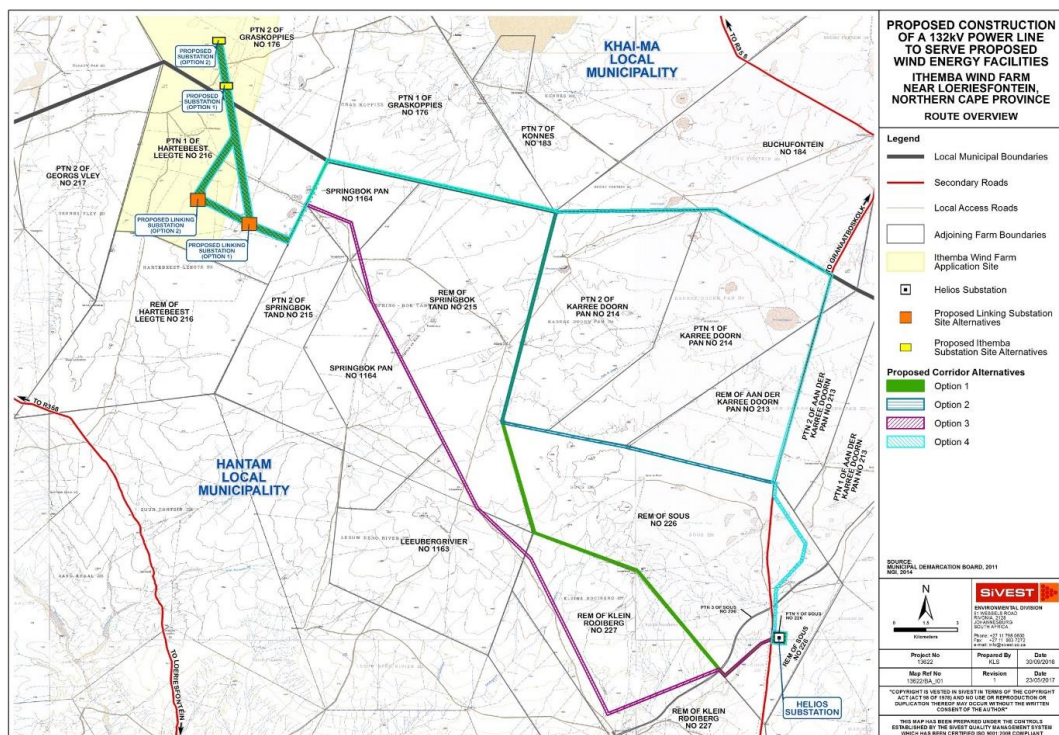


Figure 3: Site Locality Map

### 3 ASSESSMENT METHODOLOGY

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

#### 3.1 Methodology for Assessing Heritage Site significance

This HIA report was compiled by PGS for the proposed Ithemba WEF 132kV grid connection and substation. 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 and by vehicle through the proposed project area by two qualified archaeologists and two field assistants, which aimed at locating and documenting sites falling within and adjacent to the proposed development footprint. *Completed end of October 2016 and June 2017.*

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

**Appendix B**, outlines the HIA methodology, while **Appendix C** provides the guidelines for the impact assessment evaluation that was used in this EIA evaluation.

## 4 BACKGROUND RESEARCH

The examination of heritage databases, historical data and cartographic resources represents a critical additional tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Therefore, an Internet literature search was conducted and relevant archaeological and historical texts were also consulted. Relevant topographic maps and satellite imagery were studied.

### 4.1 Previous Studies

Researching the SAHRA APM Report Mapping Project records and the SAHRIS online database (<http://www.sahra.org.za/sahris>), it was determined that a number of other archaeological or historical studies have been performed within the wider vicinity of the study area. Previous studies listed for the area in the APM Report Mapping Project included a number of surveys within the area listed in chronological order below:

- MORRIS, DAVID. 2007. Archaeological Specialist input with respect to the upgrading railway infrastructure on the Sishen-Saldanha ore line in the vicinity of Loop 7a near Loeriesfontein. McGregor Museum.
- FOURIE, WOUTER. 2011. Heritage Impact Assessment for the proposed Solar Project on the farm Kaalspruit, Loeriesfontein. PGS Heritage and Grave Relocation Consultants.
- ALMOND, J.E. 2011. Palaeontological Desktop Study for the Proposed Mainstream Wind Farm Near Loeriesfontein, Namaqua District Municipality, Northern Cape Province.
- VAN SCHALKWYK, J. 2011. Heritage Impact Assessment for the proposed establishment of a wind farm and PV facility by Mainstream Renewable Power in the Loeriesfontein Region, Northern Cape Province.
- VAN DER WALT, JACO. 2012. Archaeological Impact Assessment for the proposed Hantam PV Solar Energy Facility on the farm Narosies 228, Loeriesfontein, Northern Cape Province.
- WEBLEY, L & HALKETT, D. 2012. Heritage Impact Assessment: Proposed Loeriesfontein Photo-Voltaic Solar Power Plant On Portion 5 of the Farm Klein Rooiberg 227, Northern Cape Province.
- MORRIS, DAVID. 2013. Specialist Input for the Environmental Basic Assessment and Environmental Management Program for the Khobab Wind Energy Facility: Power Line Route Options, Access Road And Substation Positions.
- ORTON, JAYSON. 2014. Heritage Impact Assessment for the proposed re-alignment of the authorized 132kV Power Line for the Loeriesfontein 2 WEF, Calvinia Magisterial District, Northern Cape.

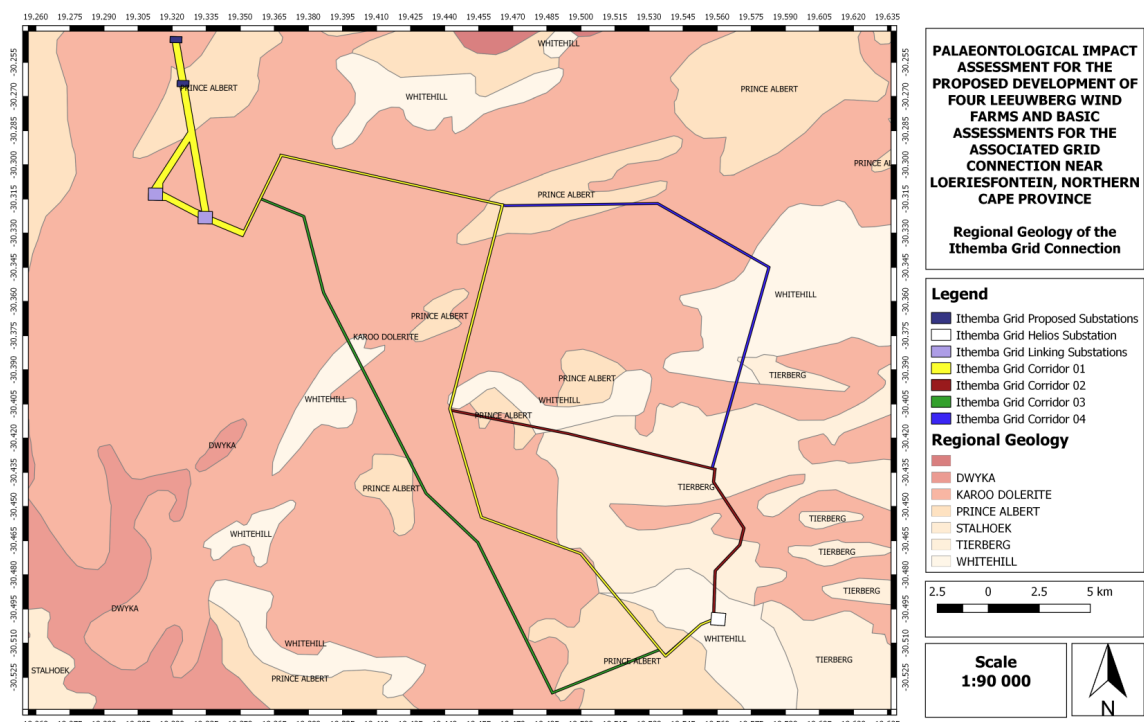
#### 4.1.1 Findings from the studies

##### Palaeontology

The following section has been compiled by Elize Butler for PGS Heritage. The full report can be viewed in **Appendix D** of this report.

The development footprint (**Figure 4**) is underlain by the Permo-Carboniferous Dwyka Group and Early to Middle Permian basinal rocks of the lower part of the Ecca Group (Karoo Supergroup). They are assigned to the Prince Albert Formation, Whitehill Formation and Tierberg Formation in order of decreasing age. The Ecca Group were laid down surrounded by the marine to freshwater Ecca Sea.

These mudrocks are generally weathered, and forms landscapes of low relief. The Ecca Group sediments, and in particular the Whitehill Formation, are intruded by Early Jurassic (183 – 200 Million years old) igneous intrusions of the Karoo Dolerite Suite (Duncan & Marsh 2006). These basic sills thermally metamorphosed or baked the neighbouring Ecca country rocks. The Permian and Jurassic bedrocks are in many areas mantled with a variety of superficial deposits, most of which is probably of Late Cenozoic (Quaternary to Recent) age. This include doleritic superficial rubble, gravelly to silty river alluvium and pan sediments and small patches of aeolian sands. The intrusive Karoo dolerites has no palaeontological significance and the Late Cenozoic superficial deposits are generally of low palaeontological sensitivity.



**Figure 4: The surface geology of the proposed grid connection of the Ithemba Wind Farm near Loeriesfontein in the Northern Cape Province. The development footprint is**

underlain by Karoo Dolerite as well as the Prince Albert, Whitehill and Tierberg Formations of the Ecce Group.

### Archaeology

Although a study conducted by Morris (2007) have indicated minimal finds of archaeological sites in the vicinity of the upgrade of Loop 7A of the Sishen-Saldanha ore line to the north of the study area, discussions with local framers have indicated the occurrence of some archaeological sites.

Morris (2010) notes that previous studies have indicated that substantial MSA scatters is fairly uncommon in the Bushmanland/Namaqualand areas. While herder sites where more limited to sheltered and dune areas close to water sources such as pans and rivers.

The HIA's (Fourie, 2011; Van Schalkwyk, 2011; Webley & Halkett, 2012 and Orton, 2014) and the AIA's (Morris, 2007; Van der Walt, 2012 and Morris, 2013), have added to the body of work conducted in the area since the observations of Beaumont et al. (1995), that "thousands of square kilometres of Bushmanland area covered by a low density lithic scatter".

Orton (2014) notes that previous studies in the vicinity of the current study area, have found and assessed archaeological material dating to the early (ESA), Middel (MSA) and Later (LSA) Stone Ages.

#### 4.1.2 Heritage sensitivities

The evaluation of the possible heritage resource finds and their heritage significance linked to mitigation requirements was linked to types of landscape. The heritage sensitivity rating does not indicate no-go areas but the possibility of finding heritage significant site that could require mitigation work.

#### 4.1.3 Possible finds

Evaluation of aerial photography has indicated that certain areas may be sensitive from an archaeological perspective. The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix in **Table 2**.

**Table 2: Landform to heritage matrix**

LAND FROM TYPE	HERITAGE TYPE
Crest and foot hill	LSA and MSA scatters
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Pans	Dense LSA sites
Outcrops	Occupation sites dating to LSA
Farmsteads	Historical archaeological material

## 5 FIELD WORK FINDINGS

### 5.1 Methodology

A survey of the study area was conducted from 24-30 October 2016 and June 2017. Due to the nature of cultural remains, with the majority of artefacts occurring below surface, two archaeologists of PGS conducted a vehicle and foot-survey that covered the study area. The fieldwork was logged with a GPS to provide a background of the areas covered (**Figure 6**).

The proposed study area is situated approximately 75 kilometres north of Loeriesfontein off the R355 in the Northern Cape.

The proposed site is characterised by a flat arid landscape. The vegetation is typical Karoo. The area is being utilized for game (mostly springbok) and sheep.

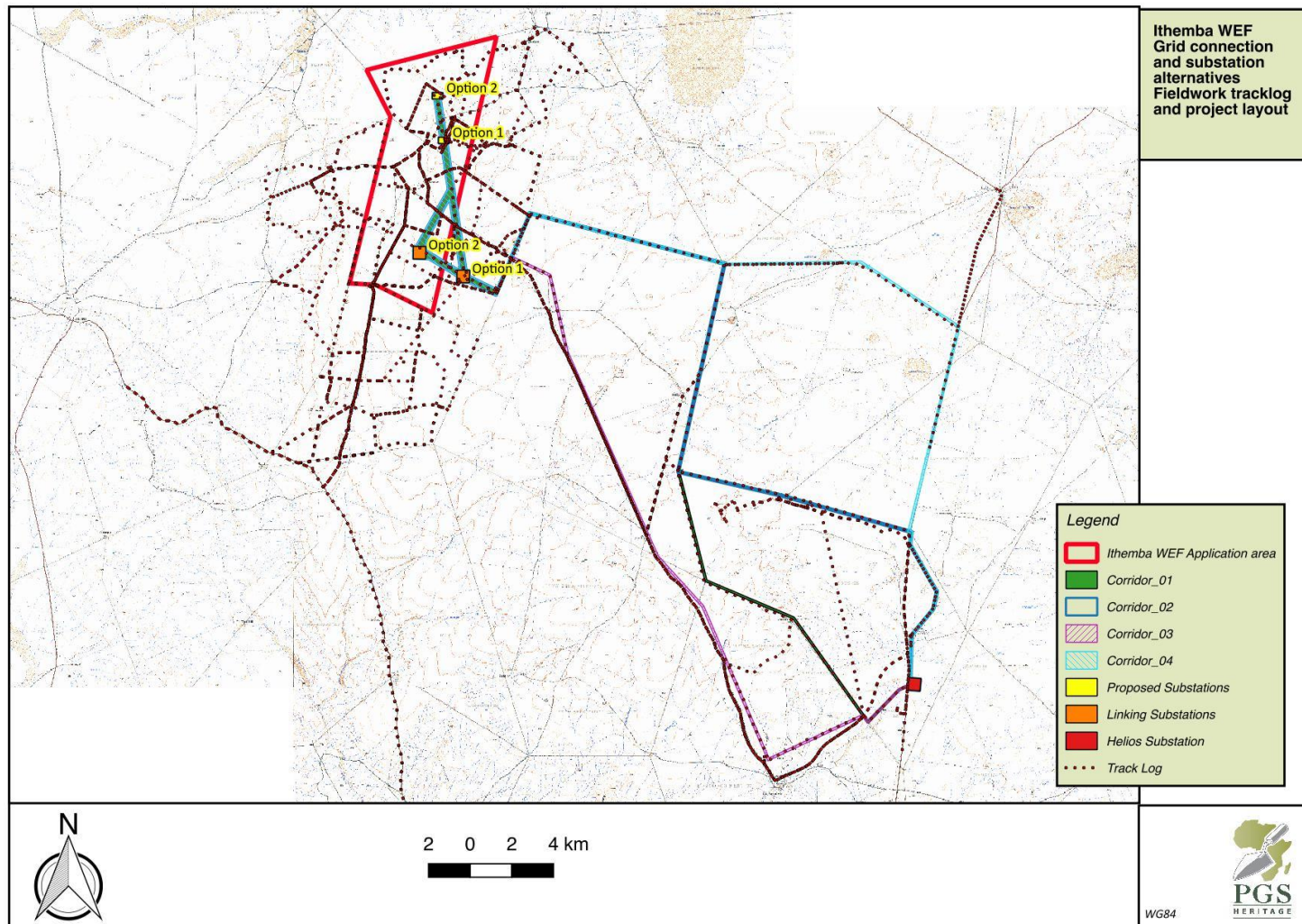


**Figure 5: View of the western side of the study area**

### 5.2 Findings

The fieldwork identified no heritage resources within the footprints of the proposed alternatives.





**Figure 6: Heritage resources with tracklog**

## 6 IMPACT ASSESSMENT

The impact rating and analysis was done based on the methodology as explained and summarised in **Appendix C** of this report. The design process and methodology followed by the developer for this project has enabled the heritage assessment to provide input into the proposed layouts. This resulted in cognisance being taken of the positions of the heritage resources and thus the reduction of impacts at an early design phase. Analysis of the impact matrix tables reflect this fact.

**No heritage resources were identified that would be affected by the proposed grid connection or substation alternatives and the following impact assessment tables are based on this fact.**

## 6.1 Impact matrix

**Table 3: Impact rating - Palaeontology**

<b>IMPACT TABLE</b>	
Environmental Parameter	<i>Impact on the Palaeontology Heritage (fossils) of the development footprint</i>
Issue/Impact/Environmental Effect/Nature (E)	<p>The excavations and vegetation clearance during the construction phase will involve extensive excavations into the superficial deposits as well as locally into the underlying bedrock. These excavations will transform the present topography and may disrupt and destroy or permanently lock-in fossils at or beneath the ground surface that are no longer accessible for research.</p> <p>This impact will usually only occur during the construction phase. No impacts are expected to occur during the operation phase.</p>
<i>Extent</i>	<p>The Leeuwborg Wind Farm project area will be located approximately 62km north of Loeriesfontein, in the Khai-ma and Hantam Local Municipalities within the Northern Cape Province.</p> <p><i>A brief description of the area over which the impact will be expressed</i></p>
<i>Probability</i>	<p>The development footprint is underlain by the Permo-Carboniferous Dwyka Group and Early to Middle Permian basinal mudrocks of the lower part of the Eccca Group (Karoo Supergroup). Permian and Jurassic bedrocks are covered with various superficial deposits, mostly Late Caenozoic (Quaternary to Recent) in age. The intrusive Karoo dolerites are of no palaeontological significance and the Late Caenozoic superficial deposits are generally of very low palaeontological sensitivity.</p> <p>The Dwyka Group is known for fish, microfossils, marine invertebrates, trace fossils and vascular plants. Aquatic vertebrate fossils (fish and mesosaurid reptiles), invertebrates and petrified wood has been identified from the Whitehill Formation. These fossils are infrequent in the Prince Albert and Tierberg Formations. According to the SAHRIS PalaeoMap the Dwyka Group has a low Palaeontological Sensitivity while the Eccca Group (Tierberg and Whitehill Formations) has a moderate palaeontological Sensitivity. But, the Palaeontological Sensitivity of the Prins Albert Formation is High.</p> <p>The probability of significant impacts on palaeontological heritage during the construction phase is low.</p>
<i>Reversibility</i>	<p>Impacts on fossil heritage are commonly irreversible. And thus well-documented records and additional palaeontological studies of fossils exposed through construction would characterise a positive impact scientifically. The probability of a negative impact on the palaeontological heritage of the area can be reduced by the execution of suitable damage mitigation procedures. If damage mitigation is correctly undertaken the benefit scale for the project will lie within the beneficial category.</p> <p><i>Fossil Heritage is expected in the Prins Albert Formation while the Eccca group has a moderate probability and the Dwyka Group a low probability of finding fossils</i></p>
<i>Irreplaceable loss of resources</i>	<p>The development footprint is underlain by the Dwyka Group (low Palaeontological Sensitivity) and Eccca Group of the Karoo Supergroup. This include the Prince Albert (high Palaeontological Sensitivity), Whitehill and Tierberg with a moderate Palaeontological Sensitivity. Permian and Jurassic bedrocks are covered with a range of superficial deposits generally of low palaeontological sensitivity. The intrusive Karoo dolerites are of no palaeontological significance</p>
<i>Duration</i>	<p>The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent</p>
<i>Cumulative effect</i>	<p>Low Cumulative Impact</p> <p>The cumulative effect of the development area within the proposed location is considered to be moderate. The broader area near Loeriesfontein is underlain by the Dwyka Group (low Palaeontological Sensitivity) and Eccca Group of the Karoo Supergroup. This include the Prince Albert (high</p>



	Palaeontological Sensitivity), Whitehill and Tierberg with a moderate Palaeontological Sensitivity. Permian and Jurassic bedrocks are covered with a range of superficial deposits generally of low palaeontological sensitivity. The intrusive Karoo dolerites are of no palaeontological significance	
<i>Intensity/magnitude</i>	Probable significant impacts on palaeontological heritage during the construction phase are high (Prins Albert Formation), and the intensity of the impact on fossil heritage is rated as high	
<i>Significance Rating</i>	<i>A brief description of the importance of an impact which in turn dictates the level of mitigation required</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	1	1
Irreplaceable loss	3	1
Duration	4	1
Cumulative effect	4	1
Intensity/magnitude	3	1
Significance rating	-48 (negative medium)	-6 (negative low)
Mitigation measures	<p>Suggested mitigation of the predictable damage and destruction of fossil within the proposed development area would involve the description and collecting of fossils within the development footprint by a professional palaeontologist. This work should take place after initial vegetation clearance but <i>prior to</i> ground levelling for construction</p> <p>Impacts on fossil heritage are usually irreversible. And thus well-documented records and additional palaeontological studies of fossils exposed through construction would characterise a positive impact scientifically. The probability of a negative impact on the palaeontological heritage of the area can be reduced by the execution of suitable damage mitigation procedures. If damage mitigation is correctly undertaken the benefit scale for the project will lie within the beneficial category.</p> <p>A site visit to the Prins Albert Formation would provide information on the presence of fossil Heritage</p>	

**Table 4: Impact rating – Heritage resources**

IMPACT TABLE		
Environmental Parameter	Heritage resources	
Issue/Impact/Environmental Effect/Nature	<p>Heritage Resources have been identified during the fieldwork having low archaeological significance.</p> <p>All the identified find spots could be impacted by construction activities however the impact is seen as negligible.</p>	
Extent	Localised	
Probability	Probable	
Reversibility	Non- renewable.	
Irreplaceable loss of resources	Archaeological sites are irreplaceable	
Duration	Permanent	
Cumulative effect	Low cumulative impact	
Intensity/magnitude	Medium	
Significance Rating	Negative medium impact before mitigation and low negative after mitigation.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2

Probability	3	1
Reversibility	4	4
Irreplaceable loss	4	4
Duration	4	4
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	-40 (Negative Medium Impact	-16 (Low negative
Mitigation measures	<p>A walk down of the final layout to determine if any significant sites will be affected.</p> <p>Monitor find spot areas if construction is going to take place through them.</p> <p>A management plan for the heritage resources needs then to be compiled and approved for implementation during construction and operations.</p> <p>Possible surface collections for sites with a medium to high significance as well as conducting a watching brief by heritage practitioner during the construction phase.</p>	

**Table 5: Impact rating – chance finds**

IMPACT TABLE		
Environmental Parameter	Unidentified heritage structures	
Issue/Impact/Environmental Effect/Nature	Due to the size of the area assessed and the design process requiring fieldwork before identification of the layout. The possibility of encountering heritage features in unsurveyed areas does exist.	
Extent	Localised and in most cases no more than 1000m <sup>2</sup>	
Probability	Probable	
Reversibility	Heritage resources are non-renewable.	
Irreplaceable loss of resources	A brief description of the degree in which irreplaceable resources are likely to be lost	
Duration	Permanent	
Cumulative effect	Medium	
Intensity/magnitude	Medium	
Significance Rating	Medium negative before mitigation and low negative after mitigation for both the expanded and the constrained layout.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	3
Reversibility	4	4
Irreplaceable loss	2	2
Duration	4	4
Cumulative effect	3	3
Intensity/magnitude	2	1
Significance rating	-34 (Medium negative)	-17 (Low negative)
	Post mitigation impact rating	
Mitigation measures	<p>A walk down of the final approved layout will be required before construction commence;</p> <p>Any heritage features of significance identified during this walk down will require formal mitigation or where possible a slight change in design could accommodate such resources.</p>	

	A management plan for the heritage resources needs then to be compiled and approved for implementation during construction and operations.
--	--

## 6.2 Confidence in Impact Assessment

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 heritage sites.

The impact assessment conducted for heritage sites assumes the possibility of finding heritage resources during the project life and has been conducted as such.

## 6.3 Cumulative Impacts

This section evaluates the possible cumulative impacts (CI) on heritage resources with the addition of the Ithemba WEF grid connection and substation. The CI on heritage resources evaluated a 30-kilometer radius (**Figure 7**). It must further be noted that the evaluation is based on available heritage studies and cannot take the findings of outstanding studies on current ongoing EIA's in consideration.

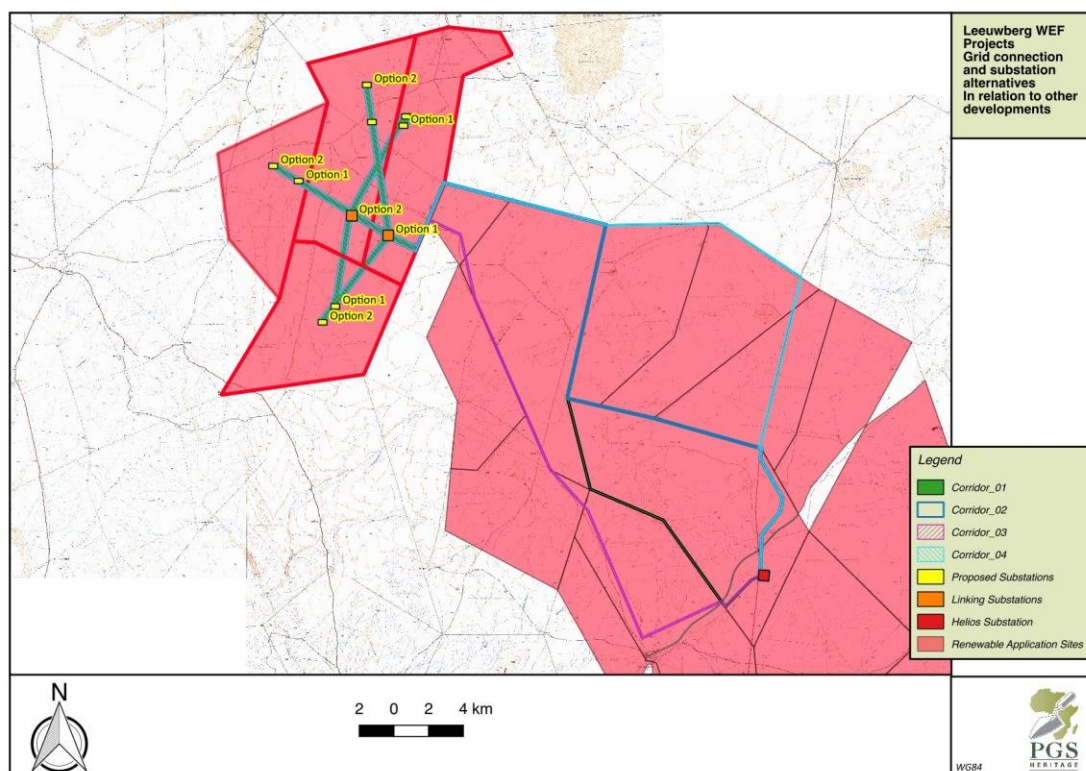
The following must be considered in the analysis of the cumulative effect of development on heritage resources:

- **Fixed datum or dataset:** There is no comprehensive heritage data set for the Copperton region and thus we cannot quantify how much of a specific cultural heritage element is present in the region. The region has never been covered by a heritage resources study that can account for all heritage resources. Further to this none of the heritage studies conducted can with certainty state that all heritage resources within the study area has been identified and evaluated;
- **Defined thresholds:** The value judgement on the significance of a heritage site will vary from individual too individual and between interest groups. Thus implicating that heritage resources' significance can and does change over time. An so will the the tipping threshold for impacts on a certain type of heritage resource;
- **Threshold crossing:** In the absence of a comprehensive dataset or heritage inventory of the entire region we will never be able to quantify or set a threshold to determine at what stage the impact from developments on heritage resources has reached or is reaching the danger level or excludes the new development on this basis. (Godwin, 2011)

Keeping the above short comings in mind, the methodology in evaluating cumulative impacts on heritage resources will be followed for the Impact Assessment phase.

The analysis of the competed studies as listed below (**Figure 7**), taking in to account the findings and recommendation of each of the nine evaluated HIA's.

- MORRIS, DAVID. 2007. Archaeological Specialist input with respect to the upgrading railway infrastructure on the Sishen-Saldanha ore line in the vicinity of Loop 7a near Loeriesfontein. McGregor Museum.
- FOURIE, WOUTER. 2011. Heritage Impact Assessment for the proposed Solar Project on the farm Kaalspruit, Loeriesfontein. PGS Heritage and Grave Relocation Consultants.
- ALMOND, J.E. 2011. Palaeontological Desktop Study for the Proposed Mainstream Wind Farm Near Loeriesfontein, Namaqua District Municipality, Northern Cape Province.
- VAN SCHALKWYK, J. 2011. Heritage Impact Assessment for the proposed establishment of a wind farm and PV facility by Mainstream Renewable Power in the Loeriesfontein Region, Northern Cape Province.
- VAN DER WALT, JACO. 2012. Archaeological Impact Assessment for the proposed Hantam PV Solar Energy Facility on the farm Narosies 228, Loeriesfontein, Northern Cape Province.
- WEBLEY, L & HALKETT, D. 2012. Heritage Impact Assessment: Proposed Loeriesfontein Photo-Voltaic Solar Power Plant On Portion 5 of the Farm Klein Rooiberg 227, Northern Cape Province.
- MORRIS, DAVID. 2013. Specialist Input for the Environmental Basic Assessment and Environmental Management Program for the Khobab Wind Energy Facility: Power Line Route Options, Access Road And Substation Positions.
- ORTON, JAYSON. 2014. Heritage Impact Assessment for the proposed re-alignment of the authorized 132kV Power Line for the Loeriesfontein 2 WEF, Calvinia Magisterial District, Northern Cape.
- Fourie, W. 2015. Heritage Impact Assessment for the proposed establishment of the Dwarsrug wind farm and PV facility in the Loeriesfontein Region, Northern Cape Province.



**Figure 7: Other RE developments in relation to the Ithemba Wind Farm application area**

**Table 6: Impact rating – Cumulative**

IMPACT TABLE		
Environmental Parameter	Heritage Resources	
Issue/Impact/Environmental Effect/Nature	The extent that the addition of this project will have on the overall impact of developments in the region on heritage resources	
Extent	Local	
Probability	Possible	
Reversibility	Non- renewable.	
Irreplaceable loss of resources	The nature of heritage resources are that they are non-renewable. The proper mitigation and documentation of these resources can however preserve the data for research	
Duration	Permanent	
Cumulative effect	It is my reserved but considered opinion that this additional load on the overall impact on heritage resources will be low. With a detailed and comprehensive regional dataset this rating could possibly be adjusted and more accurate.	
Intensity/magnitude	Low	
Significance Rating	Negative low impact before mitigation and low negative after mitigation.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	2	1
Reversibility	4	4
Irreplaceable loss	4	4
Duration	4	4
Cumulative effect	1	1
Intensity/magnitude	1	1

Significance rating	-18 (Negative medium impact)	-18 (Low negative)
Mitigation measures	A walk down of the final approved layout will be required before construction commence; Any heritage features of significance identified during this walk down will require formal mitigation or where possible a slight change in design could accommodate such resources. A management plan for the heritage resources needs then to be compiled and approved for implementation during construction and operations.	

It is my considered opinion that this additional load on the overall impact on heritage resources will be low. With a detailed and comprehensive regional dataset this rating could possibly be adjusted and more accurate.

#### 6.4 Reversibility of Impacts

Although heritage resources are seen as non-renewable the mitigation of impacts on possible finds through scientific documentation will provided sufficient mitigation on the impacts on possible heritage resources.

#### 6.5 Assessment of alternatives

It should be noted that two (2) alternative sites for the proposed on-site Ithemba Substation and the proposed Linking Substation have been assessed during the Basic Assessment (BA), in conjunction with four (4) power line corridor alternatives.

The fieldwork and site analysis of the various alternatives indicates no identified heritage resources will be impacted by the alternatives provided. No further mitigation or re-routing within the corridor alternatives will be required.



Alternative	Preference	Reasons (incl. potential issues)
<b>GRID LINE CORRIDOR ALTERNATIVES</b>		
Grid Line Option 1	<b>NO PREFERENCE</b>	No heritage resources were identified that can potentially be impacted by this option
Grid Line Option 2	<b>NO PREFERENCE</b>	No heritage resources were identified that can potentially be impacted by this option
Grid Line Option 3	<b>NO PREFERENCE</b>	No heritage resources were identified that can potentially be impacted by this option
Grid Line Option 4	<b>NO PREFERENCE</b>	No heritage resources were identified that can potentially be impacted by this option

## 7 CONCLUSIONS AND RECOMMENDATIONS

PGS was appointed by SiVEST Environmental Division (SiVEST) to undertake an HIA that forms part of the BAR and EMP for the Ithemba WEF 132kV grid connection and substation for South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream), near Loeriesfontein in the Northern Cape Province.

Heritage resources are unique and non-renewable and as such any impact on such resources must be seen as significant.

The background research completed in October 2016 has shown that the proposed Ithemba WEF grid connection and substation to be developed as a WEF may have heritage resources present on the property. This has been confirmed through archival research and evaluation of aerial photography of the sites.

The subsequent field work completed for the October 2016 and June 2017, has identified no heritage resources within any of the proposed alternative positions or alignments.

### 7.1 Impact and Cumulative Impact

Only one low significance identified heritage resources is affected by the proposed grid connection and substation layout. The impact by the proposed development on heritage resources will be low to negligible.

**It is my considered opinion that this additional load on the overall impact on heritage resources will have a low to negligible cumulative impact.**



**None of the alternatives are deemed to be unfavourable and all can be utilised from a heritage point of view.**

## **7.2 Mitigation**

The design process and methodology followed by the developer for this project will enabled the heritage assessment to provide input into the proposed layouts. This resulted in cognisance being taken of the positions of the heritage resources and thus the reduction of impacts at an early design phase

The mitigation measures proposed is a follows:

## **7.3 Pre-Construction**

4. A walk down of the final layout to determine if any significant sites will be affected.
5. Monitor find spot areas if construction is going to take place through them.
6. A management plan for the heritage resources needs then to be compiled and approved for implementation during construction and operations. Possible surface collections for sites with a medium to high significance as well as conducting a watching brief by heritage practitioner during the construction phase.
7. Avoid the historical farmstead at BHL001

## **7.4 Palaeontology**

The development footprint is underlain by the Permo-Carboniferous Dwyka Group and Early to Middle Permian rocks of the lower part of the Eccu Group (Karoo Supergroup). This include the Prince Albert, Whitehill and Tierberg Formations. Permian and Jurassic bedrocks are covered with a range of superficial deposits, mostly Late Cenozoic (Quaternary to Recent) in age. .

The Permo-Carboniferous Dwyka Group is known for its track ways that was mostly formed by fish and arthropods (invertebrates) as well as fossilized faeces (coprolites). Fossils other than trace assemblages are generally uncommon and most of the Dwyka sediments are of low overall palaeontological sensitivity. When body fossils do occur it is of marine fish, gastropods and invertebrates as well as fossil plants, spores and pollens

The fossil assemblage of the **Prince Albert Formation** consists basically of trace fossils, whereas plant fossils are found in large quantities in the sandstone rich sections in the northern parts of the Basin. The trace fossil assemblage of the non-marine *Mermia* Ichnofacies, is dominated by the ichnogenera *Umfolozia* (arthropod trackways) and *Undichna* (fish swimming trails) and are normally found in basinal mudrock facies of the Prince Albert Formation.

Fossil Heritage of the **Whitehill Formation** includes mesosaurid reptiles, palaeoniscoid fish, small eocarid crustaceans, insects, and trace fossils of king crab as well as possible shark coprolites, palynomorphs, petrified wood (mainly of primitive gymnosperms, silicified or calcified) and rare vascular plant remains.

The fossil assemblage of the **Tierberg Formation** comprise of disarticulated micro vertebrate remains (e.g. fish teeth, scales) sponge remains, rare vascular plants (leaves and petrified wood) with a medium diversity of trace fossil assemblages.

The Karoo Dolerite Suite consists of igneous rocks and are unfossiliferous. Quaternary fossil assemblages are generally rare and low in diversity and occur over a wide-ranging geographic area. These fossil assemblages may in some cases occur in extensive alluvial and colluvial deposits cut by dongas. In the past palaeontologists did not focus on Caenozoic superficial deposits although they sometimes comprise of significant fossil biotas. Fossil assemblages may comprise of mammalian teeth, bones and horn cores, reptile skeletons and fragments of ostrich eggs. Microfossils, non-marine mollusc shells and freshwater stromatolites are also known from Quaternary deposits. Plant material such as foliage, wood, pollens and peats are recovered as well as trace fossils like vertebrate tracks, burrows, termitaria (termite heaps/mounds) and rhizoliths (root casts).

According to the SAHRIS PalaeoMap the Dwyka Group has a low Palaeontological Sensitivity while the Ecca Group (Tierberg and Whitehill Formations) has a moderate palaeontological Sensitivity. But, the Palaeontological Sensitivity of the Prince Albert Formation is High and thus a site visit is recommended.

Prior to construction a detailed palaeontology study will thus be conducted to assess the value and importance of fossils in the development area and the effect of the proposed development on the palaeontological heritage. This consists of a Phase 1 field-based assessment by a professional palaeontologist. The purpose of the detailed Report is to elaborate on the issues and potential impacts identified during the initial study undertaken for the Basic Assessment (BA). This is achieved by site visits and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the BA. The report will be submitted to SAHRA before the commencement of any development-related activities.

## 8 REFERENCES

ALMOND, J.E. 2011. Palaeontological Desktop Study for the Proposed Mainstream Wind Farm Near Loeriesfontein, Namaqua District Municipality, Northern Cape Province.

FOURIE, WOUTER. 2011. Heritage Impact Assessment for the proposed Solar Project on the farm Kaalspruit, Loeriesfontein. PGS Heritage and Grave Relocation Consultants.

GODWIN, LUKE. 2011. The Application of Assessment of Cumulative Impacts in Cultural Heritage Management: A Critique. Australian Archaeology, No. 73 (December 2011), pp. 88-91

MORRIS, DAVID. 2007. *Archaeological Specialist input with respect to the upgrading railway infrastructure on the Sishen-Saldanha ore line in the vicinity of Loop 7a near Loeriesfontein.* McGregor Museum.

MORRIS, DAVID. 2007. Archaeological Specialist input with respect to the upgrading railway infrastructure on the Sishen-Saldanha ore line in the vicinity of Loop 7a near Loeriesfontein. McGregor Museum.

MORRIS, DAVID, 2010. Specialist input for the Scoping Phase of the Environmental Impact Assessment for the proposed Pofadder Solar Thermal Facility, Northern Cape Province. Archaeology. McGregor Museum.

MORRIS, DAVID. 2013. Specialist Input for the Environmental Basic Assessment And Environmental Management Program for the Khobab Wind Energy Facility: Power Line Route Options, Access Road And Substation Positions.

ORTON, JAYSON. 2014. Heritage Impact Assessment for the proposed re-alignment of the authorized 132kV Power Line for the Loeriesfontein 2 WEF, Calvinia Magisterial District, Northern Cape.

VAN SCHALKWYK, J. 2011. Heritage Impact Assessment for the proposed establishment of a wind farm and PV facility by Mainstream Renewable Power in the Loeriesfontein Region, Northern Cape Province.

VAN DER WALT, JACO. 2012. Archaeological Impact Assessment for the proposed Hantam PV Solar Energy Facility on the farm Narosies 228, Loeriesfontein, Northern Cape Province.

WEBLEY, L & HALKETT, D. 2012. Heritage Impact Assessment: Proposed Loeriesfontein Photo-Voltaic Solar Power Plant On Portion 5 of the Farm Klein Rooiberg 227, Northern Cape Province.



Appendix A

**LEGISLATIVE PRINCIPLES**

## LEGISLATIVE REQUIREMENTS – TERMINOLOGY AND ASSESSMENT CRITERIA

### 3.1 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 new legislation, 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 are 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 cemetery (such as ancestral graves in rural areas), are protected. The legislation protects the interests of communities that have interest in the graves: they may be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle will 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 developer's cost. Thus, developers 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.

### **3.2 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 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 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 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

**Heritage Assessment Methodology**

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

The Heritage Impact Assessment (HIA) report to be compiled by PGS Heritage (PGS) for the proposed Ithemba WEF will assess the heritage resources found on site. This report will contain the applicable maps, tables and figures as stipulated in the NHRA (no 25 of 1999), the National Environmental Management Act (NEMA) (no 107 of 1998) and the Minerals and Petroleum Resources Development Act (MPRDA) (28 of 2002). The HIA process consists of three steps:

Step I – Literature Review: The background information to the field survey leans greatly on the Heritage Scoping Report completed by PGS for this site.

Step II – Physical Survey: A physical survey was conducted on foot and by vehicle through the proposed project area by qualified archaeologists, 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 relevant archaeological resources, as well as the assessment of resources in terms of the heritage impact assessment criteria and report writing, as well as mapping and constructive recommendations

The significance of 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 - 10/50m<sup>2</sup>
    - Medium - 10-50/50m<sup>2</sup>
    - High - 50/50m<sup>2</sup>
- 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 pylon 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.

**Table 1: Site significance classification standards as prescribed by SAHRA**

<b>FIELD RATING</b>	<b>GRADE</b>	<b>SIGNIFICANCE</b>	<b>RECOMMENDED MITIGATION</b>
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)		High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)		Medium Significance	Recording before destruction
Generally Protected C (GP.A)		Low Significance	Destruction



## Appendix C

### **Impact Assessment Methodology to be utilised during EIA phase**

# **1 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY**

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

## **1.1 Determination of Significance of Impacts**

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 3.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

## **1.2 Impact Rating System**

Impact assessment must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

### **1.2.1 Rating System Used To Classify Impacts**

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In

assessing the significance of each issue the following criteria (including an allocated point system) is used:

<b>NATURE</b>		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
<b>GEOGRAPHICAL EXTENT</b>		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
<b>PROBABILITY</b>		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25 chance of occurrence).
2	Possible	The impact may occur (Between a 25 to 50 chance of occurrence).
3	Probable	The impact will likely occur (Between a 50 to 75 chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75 chance of occurrence).
<b>REVERSIBILITY</b>		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
<b>IRREPLACEABLE LOSS OF RESOURCES</b>		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.

2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact		

1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE		
<p>Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:</p> <p>(Extent      probability      reversibility      irreplaceability      duration      cumulative effect) x magnitude/intensity.</p> <p>The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.</p>		
Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.

29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered fatal flaws .
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.