



**Leeudoringstad Solar Plant (Pty) Ltd**

**PROPOSED DEVELOPMENT OF  
THE 132/11kV  
LEEUDORINGSTAD SOLAR  
PLANT SUBSTATION NEAR  
LEEUDORINGSTAD IN THE  
NORTH WEST PROVINCE**

**Heritage Impact Assessment**

**Department Reference:** *To be Allocated*

**Report Prepared by:** PGS Heritage (Pty) Ltd

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# LEEUDORINGSTAD SOLAR PLANT (PTY) LTD

## PROPOSED DEVELOPMENT OF THE 132/11kV LEEUDORINGSTAD SOLAR PLANT SUBSTATION NEAR LEEUDORINGSTAD IN THE NORTH WEST PROVINCE

### HERITAGE IMPACT ASSESSMENT

#### **EXECUTIVE SUMMARY**

PGS was appointed by SiVEST SA (Pty) Ltd (hereafter referred to as "SiVEST") to undertake a Heritage Impact Report that forms part of the Environmental Basic Assessment (BA) for Leeudoringstad Solar Plant (Pty) Ltd for the proposed construction of the 132/11 kilovolt (kV) Leeudoringstad Solar Plant Substation, on Portion 37 the farm Leeuwbosch No. 44, near Leeudoringstad, Maquassi Hills Local Municipality North West Province.

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

The fieldwork identified 13 heritage resources in the greater study area of the greater Leeudoringstad Solar photovoltaic (PV) Project<sup>1</sup>, however, none of the heritage resources identified are close to either of the substation site alternatives associated with this proposed substation development.

#### **Mitigation measures**

The following mitigation is suggested to reduce impacts on heritage resources:

##### **Palaeontology:**

- No mitigation measures are required.

##### **Archaeological Sites:**

- For sites LD01, LD03, LD04, LD05, LD06 and LD07, LD09, LD10, LD11 LD12 the current 20-meter buffer should be kept in place.
- We further recommend that an archaeologist monitor the earth moving activities during construction.
- We recommend that the burial site LD02 be preserved and a buffer fence of 30 meters, as per SAHRA policies, constructed around the site.

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<sup>1</sup> Greater Leeudoringstad Solar PV Project consists of Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line, Wildebeestkuil 2 Solar PV Plant & 132kV Power Line and 132/11kV Leeudoringstad Solar Plant Substation (this project).

## **1.1 Impact Statement**

The two alternative positions of the substation were considered during the site visit and impact assessment. It is our opinion that no preference for either of the sites exist as both will have the same low impact as assess on heritage resources.

If heritage resources are discovered during site clearance, construction activities must stop in the vicinity, and a qualified archaeologist must be appointed to evaluate and make recommendations on mitigation measures.

The overall impact of the Leeudoringstad Solar Plant Substation, on the heritage resources identified during this report, is seen as acceptably low after the recommendations have been implemented and therefore, impacts can be mitigated to acceptable levels allowing for the development to be authorised.

**NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)**

<b>Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6</b>	<b>Section of Report</b>
1. (1) A specialist report prepared in terms of these Regulations must contain-	
a) details of-	
i. the specialist who prepared the report; and	1.3
ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 4
c) an indication of the scope of, and the purpose for which, the report was prepared;	1.1
(cA) an indication of the quality and age of base data used for the specialist report;	1.4
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	6.3
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	1.4
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	1.4
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	6
g) an identification of any areas to be avoided, including buffers;	8
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 11
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	6.3
k) any mitigation measures for inclusion in the EMPr;	8
l) any conditions for inclusion in the environmental authorisation;	8
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	8
n) a reasoned opinion-	8
i. (as to) whether the proposed activity, activities or portions thereof should be authorised;	
(iA) regarding the acceptability of the proposed activity or activities; and	
ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	

o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	N/A
2) Where a government notice <i>gazetted</i> by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	GN648

# LEEUDORINGSTAD SOLAR PLANT (PTY) LTD

## PROPOSED DEVELOPMENT OF THE 132/11kV LEEUDORINGSTAD SOLAR PLANT SUBSTATION NEAR LEEUDORINGSTAD IN THE NORTH WEST PROVINCE

### HERITAGE IMPACT ASSESSMENT

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## Glossary of Terms

### **Archaeological resources**

This includes:

- 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;
- 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;
- 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;
- 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

### **Cultural Landscapes Terminology**

**“perceptual qualities”** Aspects of a landscape which are perceived through the senses, specifically views and aesthetics.

**“cultural landscape”** A representation of the combined worlds of nature and of man illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal (World Heritage Committee, 1992). Includes and extends beyond the study site boundaries.

**“cultural landscape area”** These are single unique areas which are the discrete geographical areas of a particular landscape type. Each will have its own individual character and identity, even though it shares the same generic characteristics with other areas of the same type.

**“study site”** The study site is assumed to include the area within the boundaries of the proposed development

**“characteristics”** elements, or combination of elements, which make a particular contribution to distinctive character.

**“elements”** individual components which make up the landscape, such as trees and fences.

**“landscape character”** A distinct, and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse.

**“landscape character assessment”** This is the process of identifying and describing variation in the character of the landscape. It seeks to identify and explain the unique combination of elements and features (characteristics) that make landscapes distinctive. This process results in the production of a Landscape Character Assessment.

**“sense of place”** The unique quality or character of a place, whether natural, rural or urban. It relates to uniqueness, distinctiveness or strong identity.

**“scenic route”** A linear movement route, usually in the form of a scenic drive, but which could also be a railway, hiking trail, horse-riding trail or 4x4 trail.

### **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:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- constructing or putting up for display signs or boards;
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil

### **Earlier Stone Age**

The archaeology of the Stone Age between ~300 000 and 3 300 000 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 and can include (but not limited to) as stated under Section 3 of the NHRA,

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa;

### **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)**

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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.

### **Site**

Site in this context refers to an area place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.

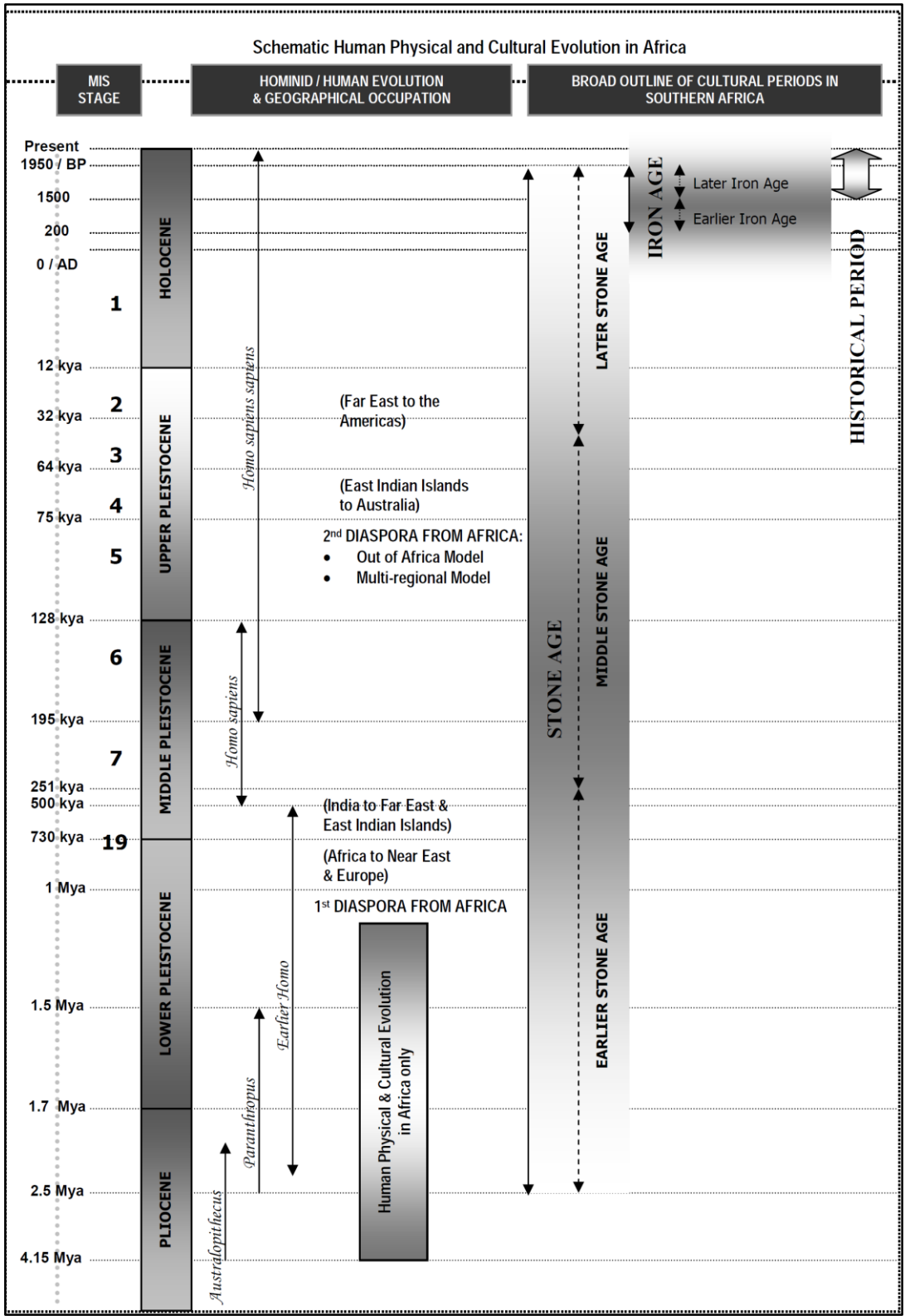


Figure 1: Human and Cultural Timeline in Africa (Morris, 2008)

### List of Abbreviations

<b>Acronyms</b>	<b>Description</b>
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEFF	Department of Environment, Forestry and Fisheries
EAP	Environmental Assessment Practitioner
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Agency
RoD	Record of Decision
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

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### HERITAGE IMPACT ASSESSMENT

#### 1. INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by SiVEST SA (Pty) Ltd (hereafter referred to as “SiVEST”) to undertake a Heritage Impact Report that forms part of the Environmental Basic Assessment (BA) for Leeudoringstad Solar Plant (Pty) Ltd for the proposed construction of a substation, on Portion 37 the farm Leeuwbosch No. 44, near Leeudoringstad, Maquassi Hills Local Municipality North West Province (hereafter referred to as the “proposed development”). The proposed development will have a capacity of 132/11 kilovolts (kV) and will be known as the Leeudoringstad Solar Plant Substation. The overall objective of the proposed development is to feed the electricity generated by the proposed Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line (part of separate respective on-going BA processes) into the national grid and “wheel” the power to customers based on a power purchase agreement. Additionally, an agreement is in place to sell the energy to PowerX, who hold a National Energy Regulator of South Africa (NERSA)-issued electricity trading license which allows them to purchase energy generated from clean and renewable resources and sell it to its customers.

##### 1.1 Scope and Objectives

The aim of the study is to identify possible heritage resources, sites, finds and sensitive areas that may occur in the study area for the BA study. The HIA aims to inform the BA in the development of a comprehensive Environmental Management Programme (EMPr) 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 Terms of Reference

Please see **Appendix D**.

##### 1.3 Specialist Credentials

PGS Heritage (PGS) compiled this Heritage Impact Report.

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, 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, archaeologist and researcher for this report, has 5 years of experience in the industry and holds a Masters degree in Archaeology and is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA).

## **1.4 Assessment Methodology**

This HIA report was compiled by PGS for the proposed development of the 132/11kV Leeudoringstad Solar Plant Substation. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the 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 of the application area, by a qualified archaeologist (16 September 16 and 23 April 2021).

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

## **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 area. Various factors account for this, including the subterranean nature of some archaeological sites and the current dense vegetation cover. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.

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

### 3. TECHNICAL DESCRIPTION

#### 3.1 Project history

The original BA process for the proposed Leeudoringstad Solar Plant Substation was initiated in August 2016. All specialist studies were undertaken and subsequently all site sensitivities were identified. The specialist studies and draft basic assessment reports (DBARs) were completed and released for 30-day public review. The BA was however put out on hold prior to submitting the final basic assessment reports (FBARs) to the Department of Environmental Affairs (DEA). In February 2017, the proposed capacity and location of the substation was amended, and a new connection point was assessed. However, the project was put on hold prior to submitting the application forms to the DEA or commencing with the legislated public participation process. In August of 2020, Leeudoringstad Solar Plant Substation proposed a new substation site (now referred to as the Leeudoringstad Solar Plant Substation) outside of all site sensitivities that were identified in 2016, and as such specialist studies have been commissioned to assess and verify the substation under the new Gazetted specialist protocols<sup>2</sup>.

#### 3.2 Project Location

As mentioned, Leeudoringstad Solar Plant is proposing to construct a substation approximately 7km north-east of the town of Leeudoringstad in the Maquassi Hills Local Municipality, which falls within the Dr Kenneth Kaunda District Municipality in the North West Province of South Africa (hereafter referred to as the “proposed development”) (**Figure 2** and **Figure 3**). The proposed development is located directly west of the Harvard Substation, where the current supply of electricity for the local areas and businesses is extracted from (Figure 3 and **Figure 4**).

The proposed substation will be located on the following property:

- Portion 37 of the Farm Leeuwbosch No. 44.

The above-mentioned property is approximately 124.691ha in extent. The proposed substation will however only cover an area of up to approximately 10 016m<sup>2</sup> (≈1ha) (**Figure 3**).

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<sup>2</sup> GOVERNMENT GAZETTE No. 43110, PROCEDURES FOR THE ASSESSMENT AND MINIMUM CRITERIA FOR REPORTING ON IDENTIFIED ENVIRONMENTAL THEMES IN TERMS OF SECTIONS 24(5)(a) AND (h) AND 44 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998, WHEN APPLYING FOR ENVIRONMENTAL AUTHORISATION, 20 MARCH 2020.

In terms of sections 24(5)(a), (h) and 44 of the National Environmental Management Act, 1998, prescribe general requirements for undertaking site sensitivity verification and for protocols for the assessment and minimum report content requirements of environmental impacts for environmental themes for activities requiring environmental authorisation, as contained in the Schedule hereto. When the requirements of a protocol apply, the requirements of Appendix 6 of the Environmental Impact Assessment Regulations, as amended, (EIA Regulations), promulgated under sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), are replaced by these requirements. Each protocol applies exclusively to the environmental theme identified within its scope. Multiple themes may apply to a single application for environmental authorisation, and assessments for these themes must be undertaken in accordance with the relevant protocol, or where no specific protocol has been prescribed, in accordance with the requirements of the EIA Regulations.



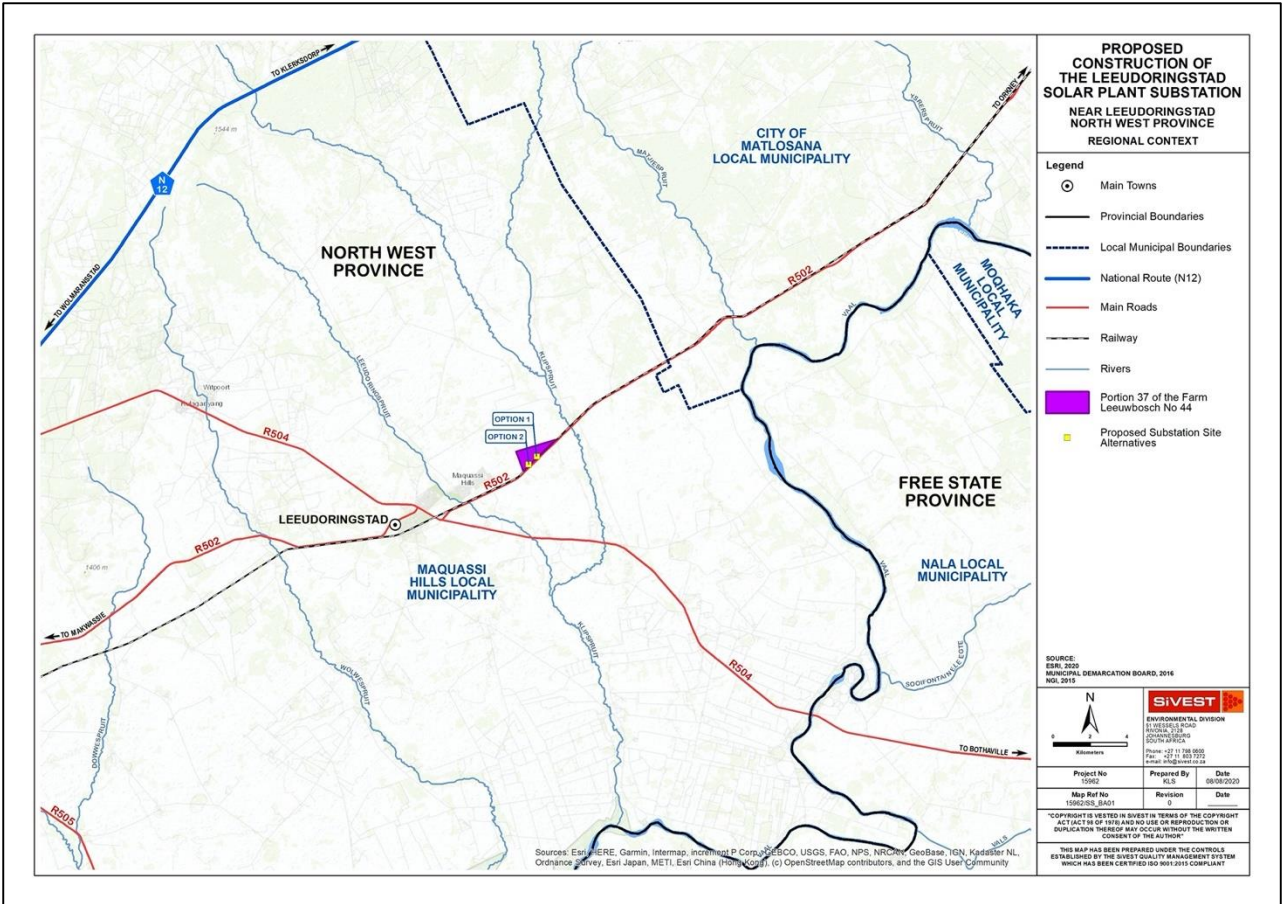
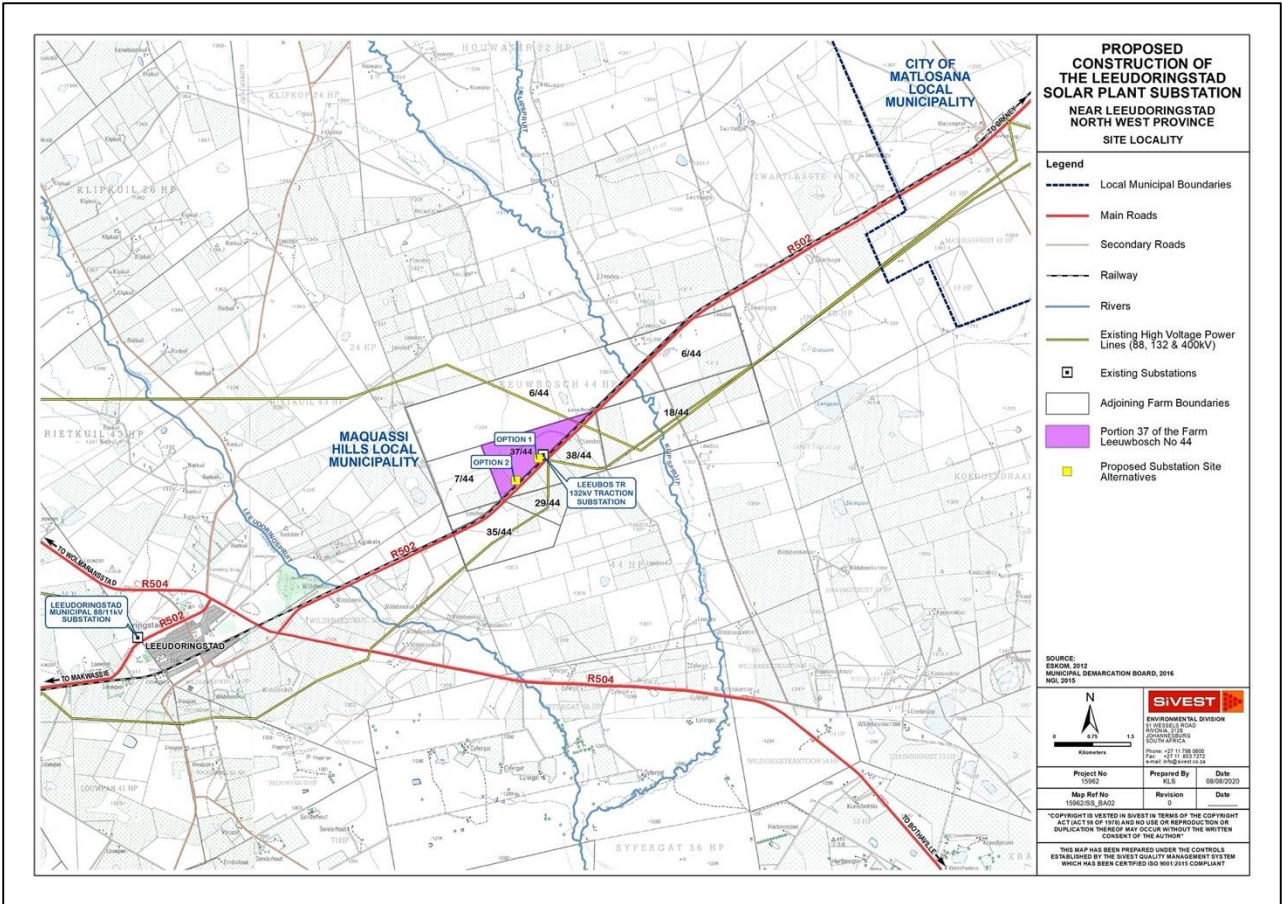


Figure 2: Regional context – Leeudoringstad Solar Plant Substation



**Figure 3: Site locality – Leeudoringstad Solar Plant Substation**

**3.3 Project Description**

At this stage, it is anticipated that the proposed development will include the following components:

- One (1) new 132/11kV substation (namely the Leeudoringstad Solar Plant Substation) to serve the Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line (part of separate respective BA process).

As mentioned, once fully developed, the intention is to feed the electricity generated by the proposed Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line (part of a separate respective BA processes) into the national grid and “wheel” the power to customers based on a power purchase agreement. Additionally, an agreement is in place to sell the energy to PowerX, who hold a NERSA-issued electricity trading license which allows them to purchase energy generated from clean and renewable resources and sell it to its customers.

The construction phase will be between 12 and 24 months and the operational lifespan will be approximately 20 years, depending on the length of the power purchase agreement with the relevant off taker.

### 3.4 Layout Alternatives

#### 3.4.1 Location alternatives

No site alternatives for this proposed development were considered as the placement of the proposed substation is dependent on the location of the proposed Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line (part of a separate BA processes).

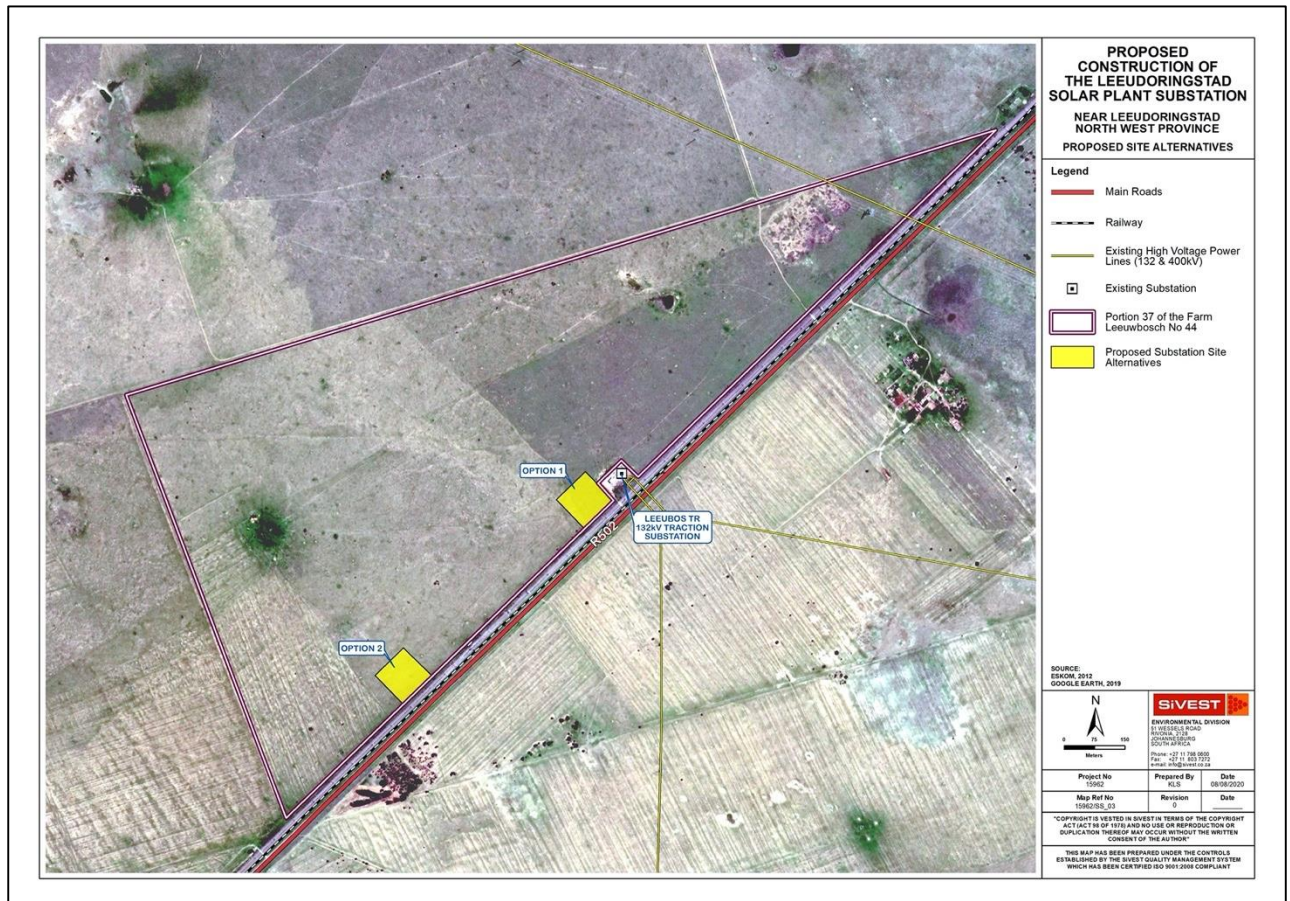


Figure 4: Location of Proposed Substation Site Alternatives (in yellow)

#### 3.4.2 Technology alternatives

No other activity / technology alternatives are being considered. Renewable energy development in South Africa is highly desirable from a social, environmental and development point of view. Based on the flat terrain, the climatic conditions and current land use being agricultural, it was determined that the proposed site would be best-suited for a substation associated with a solar PV plant, instead of any other type of renewable energy technology. It is generally preferred to install wind energy facilities (WEFs) on elevated ground. In addition, concentrated solar power (CSP) installations are not feasible because they have a high water requirement and the project site is located in a relatively arid area. There is also not enough rainfall in the area to justify a

hydro-electric plant. Therefore, the only feasible technology alternative on this site is solar PV with an associated substation and as such this is the only technology alternative being considered.

### 3.4.3 *Layout alternatives*

Design and layout alternatives were considered and assessed as part of a previous BA process that was never completed, as such the substation site has been placed to avoid site sensitivities identified as part of a previous BA process as well as the current BA processes. Specialist studies were originally undertaken in 2016 and all current layouts and/or positions being proposed were selected based on the environmental sensitivities identified as part of these studies in 2016. All specialist studies which were undertaken in 2016 were however updated in 2020 (including ground-truthing, where required) to focus on the impacts of the layouts being proposed as part of the current project. The results of the updated specialist assessments have informed the layout being proposed as part of the current BA process. The proposed substation site has therefore been informed by the identified environmental sensitive and/or “no-go” areas.

Two (2) different location alternatives for the substation site were however identified and assessed as part of the current BA process (**Figure 4**).

### 3.4.4 *The operational aspects of the activity*

No operational alternatives were assessed in the BA, as none are available for substations.

### 3.4.5 *‘No-go’ alternative*

The ‘no-go’ alternative is the option of not fulfilling the proposed project. This alternative would result in no environmental impacts from the proposed project on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report. Implementing the ‘no-go’ option would entail no development.

The ‘no-go’ option is a feasible option; however, this would prevent the Leeudoringstad Solar Plant Substation from contributing to the environmental, social and economic benefits associated with the development of the renewables sector.

## **4. LEGAL REQUIREMENT AND GUIDELINES**

### **4.1 Statutory Framework: The National Heritage Resources (Act 25 of 1999)**

The NHRA has applicability, as the study forms part of an overall HIA in terms of the provisions of Section 34, 35, 36 and 38 of the NHRA and forms part of a heritage scoping study that serves to identify key heritage resources, informants, and issues relating to the palaeontological, archaeological, built environment and

cultural landscape, as well as the need to address such issues during the impact assessment phase of the HIA process.

#### 4.1.1 Section 35 – Archaeology, Palaeontology and Meteorites

According to Section 35 (Archaeology, Palaeontology and Meteorites) and Section 38 (Heritage Resources Management) of the NHRA, PIAs and AIAs are required by law in the case of developments in areas underlain by potentially fossiliferous (fossil-bearing) rocks, especially where substantial bedrock excavations are envisaged, and where human settlement is known to have occurred during prehistory and the historic period.

#### 4.1.2 Section 36 – Burial Grounds & Graves

A section 36 permit application is made to the SAHRA or the competent provincial heritage authority which protects burial grounds and graves that are older than 60 years and must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit. SAHRA must also identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with these graves and must maintain such memorials. A permit is required under the following conditions:

Permitting requirements for burial grounds and graves older than 60 years (prehistoric) and historic burials to the South African Heritage Resources Agency:

- a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves.
- b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.
- d) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant.

#### 4.1.3 Section 38 HIA as a Specialist Study within the BA in Terms of Section 38(8)

A NHRA Section 38 (Heritage Impact Assessments) application to SAHRA is required when the proposed development triggers one or more of the following activities:

Permitting requirements for demolition of built environment features:

- a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- b) the construction of a bridge or similar structure exceeding 50 m in length;

- c) any development or other activity which will change the character of a site,
  - i. exceeding 5 000 m<sup>2</sup> in extent; or
  - ii. involving three or more existing erven or subdivisions thereof; or
  - iii. involving three or more erven or divisions thereof which have been consolidated within the past five years; or
  - iv. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- d) the re-zoning of a site exceeding 10 000 m<sup>2</sup> in extent; or
- e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority

In this instance, the heritage assessment for the property is to be undertaken as a component of the BA for the project. Provision is made for this in terms of Section 38(8) of the NHRA, which states that:

This is an HIA submitted to the relevant authority in terms of Section 38(8) of the National Heritage Resources Act. The commenting authority is the SAHRA. The authorising government agency is the North West Department of Economic Development, Environment, Conservation and Tourism (NW DEDECT).

An HIA report is required to identify, and assess archaeological resources as defined by the Act, assess the impact of the proposal on the said archaeological resources, review alternatives and recommend mitigation (see methodology above).

Section 38 (3) Impact Assessments are required, in terms of the statutory framework to conform to basic requirements as laid out in Section 38(3) of the NHRA. These are:

- The identification and mapping of heritage resources in the area affected
- The assessment of the significance of such resources
- The assessment of the impact of the development on the heritage resources
- An evaluation of the impact on the heritage resources relative to sustainable socio/economic benefits
- Consideration of alternatives if heritage resources are adversely impacted by the proposed development
- Consideration of alternatives
- Plans for mitigation in the future

#### 4.1.4 Notice 648 of the Government Gazette 45421

Although minimum standard for archaeological and palaeontological assessments<sup>3</sup> were published by SAHRA and Heritage Western Cape<sup>45</sup>, Government Notice (GN) 648 requires sensitivity verification for a site selected on the national web based environmental screening tool for which no specific assessment protocol

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<sup>3</sup> South African Heritage Resources Agency. 2007. *Minimum Standards: Archaeological and Palaeontological Components Of Impact Assessment Reports*. May 2007

<sup>4</sup> Heritage Western Cape. 2016. *Guide for Minimum Standards for Archaeology and Palaeontology Reports Submitted to Heritage Western Cape*. June 2016

<sup>5</sup> Heritage Western Cape. 2016. *Guidelines for Heritage Impact Assessments required in terms of Section 38 of the National Heritage Resources Act (Act 25 of 1999)*.

related to any theme has been identified. The requirements for this GN is listed in **Table 1** and the applicable section in this report noted.

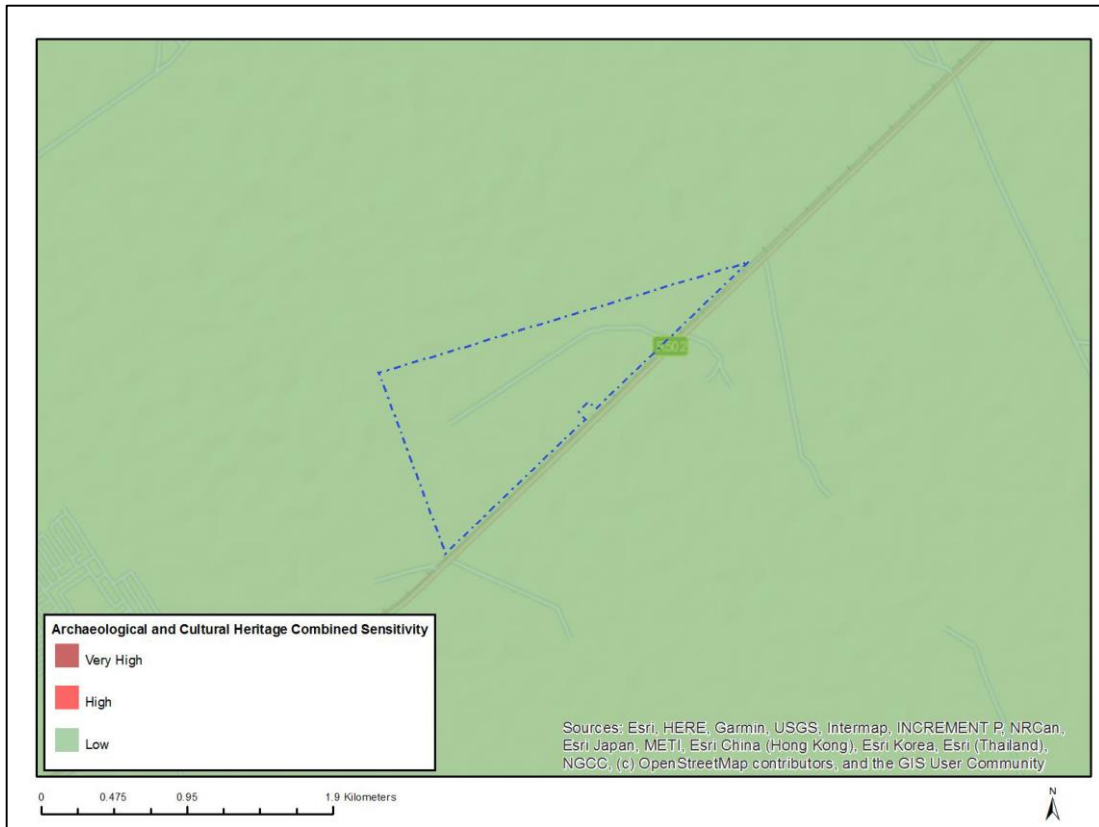
**Table 1: Reporting requirements for GN648**

<b>GN 648</b>	<b>Relevant section in report</b>	<b>Where not applicable in this report</b>
2.2 (a) a desk top analysis, using satellite imagery;	section 4	
2.2 (b) a preliminary on-site inspection to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity as identified on the national web based environmental screening tool, such as new developments, infrastructure, indigenous/pristine vegetation, etc.	section 5	-
2.3(a) confirms or disputes the current use of the land and environmental sensitivity as identified by the national web based environmental screening tool;	section 5	-
2.3(b) contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity;	Section 5 provides a description of the current use and confirms the status in the screening report	

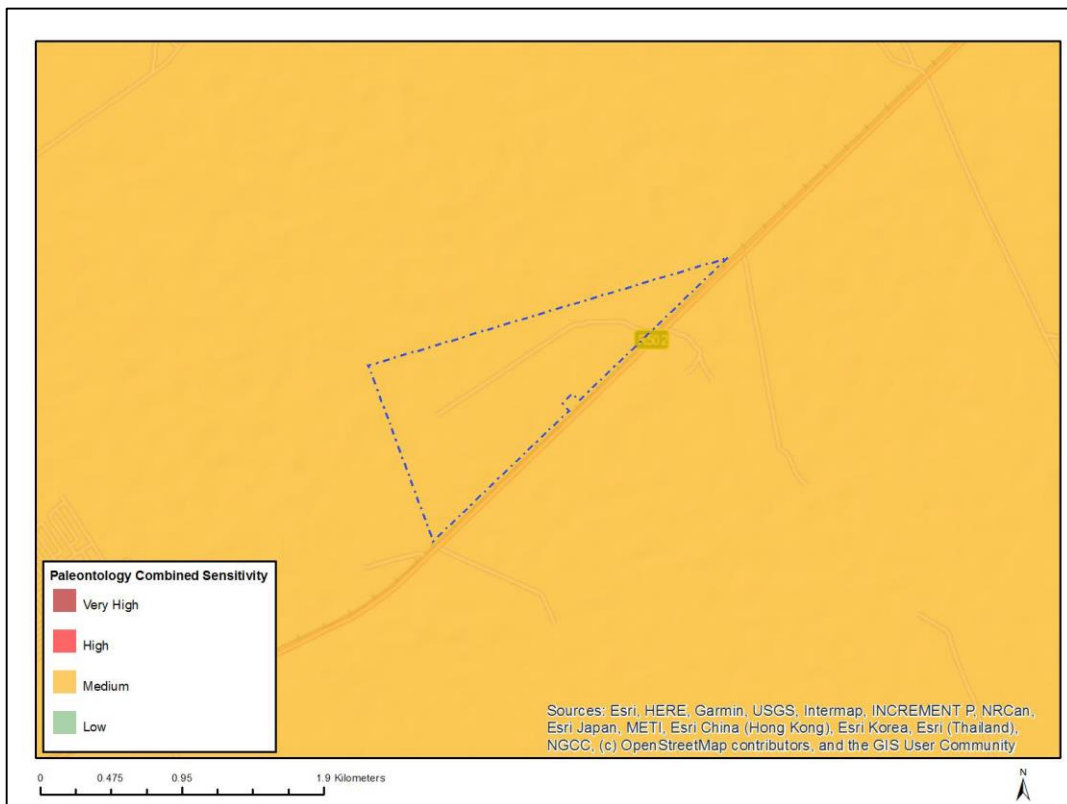
An assessment of the Environmental Screening tool provides sensitivity ratings for archaeological and heritage resources of low (**Figure 5**) and for palaeontological resources medium (**Figure 6**).

These ratings are however incorrect for the palaeontological resources and is assessed as having a low sensitivity as assessed by Butler (2021). The archaeological and cultural heritage rating varies between high for the burial ground identified and low for various structures having a low heritage significance rating identified in the greater Leeuwbosch study area.

Confirming again, as with other HIA conducted, that the screening tools for palaeontology, archaeology and cultural heritage resources only applies more accurately to regional assessments. The absence of a detailed regional and national heritage database as explained in section 6.2 of this report, shows the accuracy of the Environmental Screening tool as lacking for site specific assessments.



**Figure 5: Environmental screening tool - archaeological and cultural heritage sensitivity**



**Figure 6: Environmental screening tool - palaeontology sensitivity**



#### 4.1.5 NEMA – Appendix 6 requirements

The HIA report has been compiled considering the National Environmental Management Act (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) Appendix 6 requirements for specialist reports as indicated in the table on page 2 and 3 of this report. For ease of reference the table provides cross references to the report sections where these requirements have been addressed.

## 5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

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.

### 5.1 Previous Studies

Researching 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:

Dreyer, C., 2007. *First phase archaeological and historical investigation of the proposed residential developments on the farm Kransdrift 243, Bothaville, Free State*. No archaeological or historical sites were located. This site occurs approximately 37 km SW from the present study area.

Kusel, U., 2007. *Cultural Heritage Resources Impact Assessment of Goedvoornuitzicht 242 IP Hartbeesfontein, North West Province*. Late Iron Age settlements located. Approximately 50 km NW from the present study area.

Van der Walt, J., 2007. *AIA, Township development on Subdivision of AH 19, Pretoriuskraal, Orkney, North West Province*. No sites located. Occurs approximately 46 km NE of present study area.

Coetzee, F. P., 2012. *Cultural Heritage Scoping (Predictive) Survey of the Proposed Kabi Witkop Solar PV Facility near Orkney, Dr Kenneth Kaunda District, North West Province*. No sites located. Approximately 46 Km NE from present study area.

Coetzee, F. P., 2012. *Cultural Heritage Survey of the Proposed Kabi Vaalkop Solar PV Facility near Orkney, Dr Kenneth Kaunda District, North West Province*. Two historical structures located. Approximately 46 Km NE from present study area.

Van Schalkwyk, J., 2013. *Heritage impact Assessment for the proposed development of a PV Power Plant on a portion of the farm Matjesspruit 145HP, Leeudoringstad Region, North West Province*. Graves, historical structures and stone age material located. Approximately 15 km E of present study area.

Pelser, A. J., 2015. *Phase 1 HIA report for the proposed Wolmaransstad extension 17 Township Development on the remaining extent of Portion 32 of the farm Wolmaransstad Town and Townlands 184HO, Wolmaransstad, Northwest Province*. Several historical structures and Stone Age material were located. Approximately 30 km W of the present study area.

Van der Walt, J., 2015. *Archaeological scoping report for the proposed Orkney, north West province*. No sites located. Approximately 30 km NE of present study area.

## 5.2 Historical background

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 technological phases is known as Oldowan, which is associated with crude flakes, and hammer stones and dates to approximately 2 million years ago. The second technological phase in the Earlier Stone Age of Southern Africa is known as the Acheulean and comprises more refined and better made stone artefacts such as the cleaver and bifacial handaxe. The Acheulean phase dates back to approximately 1.5 million years ago. Prof. Revil Mason identified early Stone Age material along the banks of the Vaal River during an archaeological survey of the footprint of the Oppermandrift Dam (Bloemhof Dam) in 1966. One of the sites (Munro's Site) identified during the survey was subsequently excavated (Mason, 1969).
250,000 to 40,000 years ago	The Middle Stone Age is the second oldest phase identified in South Africa's archaeological history. It is associated with flakes, points and blades manufactured by means of the prepared core technique.
40,000 years ago to the historic past	The Later Stone Age is the third phase in South Africa's Stone Age history. It is associated with an abundance of very small stone artefacts (microliths). The Munro Site found by Revil Mason during his survey of the Oppermandrift Dam (see above) also included a Later Stone Age component. The Later Stone Age is also associated with rock engravings and rock paintings. Rock engravings are known from the direct and wider vicinity of the study area (Bergh, 1998). Dr. Benjamin Smith of the Rock Art Research Institute at the University of Witwatersrand indicates that two San rock engraving sites are located on the farm Kareeboom 228 HO (Smith, 2011). This farm is located approximately 30 km West of the present study area.

DATE	DESCRIPTION
1500 – 1700	<p>This period is associated with a Late Iron group referred to as the Olifantspoort facies of the Urewe Tradition. The Olifantspoort facies originated from the Icon facies (AD1300 – 1500) and led to the Thabeng facies (AD1700 – 1840) (Huffman, 2007). The Olifantspoort facies (with the Letsibogo facies in Botswana and the Madikwe facies in the area between Makapansgat and Botswana) represents the second phase in the development of Moloko and were represented by an absence of any stonewalling. Olifantspoort pottery is characterised by “<i>multiple bands of fine stamping or narrow incision separated by colour</i>” (Huffman, 2007:193).</p>
1700 – 1820	<p>This period is associated with the Late Iron Age group known as the Thabeng facies of the Urewe Tradition. As indicated above this facies followed on the Olifantspoort facies as the third facies in the development of Moloko in this area. The Thabeng pottery is characterised by “<i>incised triangles, coloured chevrons and arcades</i>” (Huffman, 2007:197) whereas the settlements are stonewalled. Their layout conformed to Type Z settlements which can be described as “...<i>a loose circle of individual bilabial households surrounding the core...</i>” (Huffman, 2007:41).</p>
1795	<p>During this time Legassick (2010) indicates that the study area fell within the Rolong sphere of influence.</p> <p>Before this time the Rolong were mainly settled south of the Vaal River. Under their leader Tau (c. 1700 – 1760) they were a strong group with a vast sphere of influence and in control of strong trade networks. However, after his death the Rolong moved northward to settle along the headwaters of the Molopo River. The period after Tau’s death saw fissures develop which (after the death of Tau’s son Ratlou and in turn the death of his son Seitshiro) led to the division of the once united Rolong into at least five groups, namely the Rolong-Mariba, Rolong-Ratlou, Rolong-Tshidi, Rolong-Seleka and Rolong-Rapulana. In roughly 1790 the Rolong-Seleka, followed by the Rolong-Rapulana, left the Molopo River to settle at Thabeng near Klerksdorp (Legassick, 2010).</p>
Early 1820s	<p>During the early 1820s Burchell records the Tlhaping at Dithakong, the missionary Broadbent records the Rolong on top of the Platberg (at Thabeng) and the Kubung were associated with several localities in the Free State such as OMB1. These three groups form a South-western Sotho-Tswana cluster which can be associated with Thabeng pottery and Type Z walling (Huffman, 2007).</p>
1823	<p>As a result of increasing numbers of raiding groups crossing over the Vaal River from the south as part of the social dynamics of the Difaqane, the Rolong-Seleka</p>

DATE	DESCRIPTION
	<p>abandoned their settlement at Thabeng and moved along the northern bank of the Vaal River in a western direction.</p>
February 1823	<p>The Methodist Reverends Samuel Broadbent and Thomas Hodgson (with their respective families) established a mission station on the farm Leeuwfontein a short distance east of Wolmaransstad (Oberholster, 1972) and 20 km NW of the present study. The two missionaries had met Chief Sefunelo of the Rolong-Seleka on his movement away from Thabeng, and asked him to settle in this vicinity (Legassick, 2010). It is worth noting that Breutz (1955) indicates that the Rolong-Seleka was already settled here when the missionaries arrived.</p> <p>It is significant to note that the Broadbent mission station was the first one to be established north of the Vaal River (Oberholster, 1972).</p> <p>During 1824 Hodgson was instructed to return to Cape Town with the Reverend Archbell sent up to replace him. However, before Archbell could reach the mission station Broadbent left due to ill health. Although Hodgson rebuilt the mission station in 1826 he later abandoned it and moved to Boetsap (Oberholster, 1972).</p>
January 1824	<p>The Taung under their leader Moletsane attacked the Rolong-Seleka of Sefonela at their settlement in the vicinity of the Broadbent mission station. This attack was believed to have been in response to an earlier attack of the Rolong-Seleka on them. The Rolong-Seleka were forced to abandon their settlement, and eventually joined to the Rolong-Ratlou and Rolong-Tshidi at Phitsane on the Molopo River (Legassick, 2010). The mission station was also destroyed during the attack.</p>
c. 1827	<p>During this time the Taung under Moletsane crossed over the Vaal River from the south and settled along the Makwassie Stream. From here they undertook various attacks on the peripheral settlements and outposts of the Khumalo-Ndebele of Mzilikazi, who were established along the Magaliesberg Mountains further to the east (Bergh, 1998).</p>
c. July 1829	<p>The Khumalo-Ndebele attacked the Taung along the Makwassie Stream in response to an attack, which a combined Taung, Griqua and Koranna force had made the previous year on the Ndebele. The Taung were defeated and fled to the Modder River to the south (Bergh, 1998).</p>
1839	<p>In 1839 the town and district of Potchefstroom were established (Bergh, 1998). This followed on the arrival of the Voortrekkers in the wider landscape during 1836.</p>

DATE	DESCRIPTION
	<p>The establishment of a Voortrekker town at Potchefstroom led to the increasing expansion of white farms toward the west. As a result, the 1840s saw the establishment of the first white farms along the Makwassie Stream. Some of the earliest farms on the eastern bank of the Makwassie Stream included Vlakfontein, Rietfontein, Zedelingsfontein and Goedvoorzicht (Bergh, 1998). These farms are all located north of Wolmaransstad.</p>
1841 - 1850	<p>During this time the establishment of farms by Voortrekkers expanded from Potchefstroom and reached the Makwassie Stream (Bergh, 1998).</p>
April - June 1871	<p>An arbitration commission held hearings in Bloemhof during this period. The commission was asked to provide an arbitrated solution to the exact position of the western boundary of the <i>Zuid-Afrikaansche Republiek</i>. It came as a result of increasing levels of disagreement and discontent between the Z.A.R. on the one hand, and the Rolong, Tlhaping and the Koranna (amongst others) on the other. The commission comprised the British magistrate at Klipdrif, John Campbell and the Z.A.R. magistrate of Wakkerstroom, A.A. O' Reilly. When the two individuals failed to reach an agreement, the Lieutenant-Governor of Natal, R.W. Keate, was asked to provide the final recommendations of the commission.</p> <p>In the vicinity of the study area the Keate Award (as Keate's findings are referred to) defined the western boundary of the Z.A.R. along the Makwassie Stream (Bergh, 1998). This means that the study area now fell outside of the Z.A.R.</p>
1881	<p>After the end of the Anglo-Transvaal War (also referred to the First Boer War), which terminated the two-year British annexation of the Z.A.R., the Pretoria Convention of 1881 redefined the western boundary of the Z.A.R. The recommendations of the convention were largely based on the investigations undertaken by Lieutenant-Colonel C.J. Moysey who had been appointed by the British government during the previous year to investigate the Keate Award of 1871 through map surveys and field assessments. According to the recommendations of the Pretoria Convention the western boundary of the Z.A.R. was moved from the Makwassie Spruit to roughly the Harts River. In 1884 the western boundary of the Z.A.R. was again moved further west as a result of the recommendations of the London Convention (Bergh, 1998).</p>
19 August 1884	<p>The government of the <i>Zuid-Afrikaansche Republiek</i> (Z.A.R.) provided permission for a town to be established in the Makwassie ward. This permission came as a result of the investigations undertaken by J.M.A. Wolmarans and Commandant Piet Cronjé of Potchefstroom. Although stands for the town were already being laid out in 1888, a dispute arose as to exactly where the new town should be established. The three disputed localities for the new town were Witpoort in the east, portions of the farms Rooderand and Vlakfontein in the</p>

DATE	DESCRIPTION
	<p>centre and Leeufontein in the west. When President Paul Kruger heard of the dispute he paid a visit to the area and personally viewed each of the three possibilities. Before he returned to Pretoria he decided that the town would be laid out on the western bank of the Makwassie Stream on portions of the farms Rooderand and Vlakfontein. On 16 February 1891 the town of Wolmaransstad was officially proclaimed by the government of the Z.A.R (Van Zijl, 1966).</p>
1899 – 1902	<p>A number of significant events can be associated with the general vicinity of the study area during the South African War.</p> <p>The town of Wolmaransstad was occupied by Republican forces at the beginning of 1901 and shortly thereafter a military court known as the <i>Militaire Hof voor de Westelijke Districten der ZAR</i> was established by the Boer authorities. The reason for the establishment of an almost permanent court in the town was due to the fact that Wolmaransstad was not connected to the railway system and as a result British forces only occupied the town for short periods of time. Although the court proceedings took place under difficult circumstances due to the effect of war and numerous attacks on the town, a large number of cases were tried. Of specific interest is that the court had jurisdiction in terms of Boer forces and men in both the Z.A.R. and Free State Republic. Boer general and later prime minister of South Africa, General Jan Smuts, referred to this court as the start of a united South Africa because of its jurisdiction over international boundaries between the Boer republics. However, the British viewed the court in a completely different light and after the war numerous attempts were made to have at least some members of the court charged with war crimes (Blake, 2010).</p> <p>During the war the nearby town of Wolmaransstad was attacked and occupied by the British on a number of occasions. One of these attacks took place on 5 March 1901 when a British column under Lord Methuen attacked the town. The column then turned south intending to assist the British garrison at Hoopstad. However, a skirmish developed with the local Boer commando between Wolmaransstad and the Vaal River. The British eventually managed to reach Commando Drift but found the river in flood and had to follow the bank of the river for almost 10 days before eventually reaching Fourteen Streams (Van Zijl, 1966).</p> <p>Two more attacks on Wolmaransstad took place on 17 December 1901 and 28 December 1901. On 10 February 1902 Lieutenant-Colonel Von Donop occupied the town again after receiving instructions to do so from Lord Methuen. He remained in town for roughly a month (Van Zijl, 1966).</p>
c. 1910	<p>The town of Makwassie (also known as Maquassi) was established during this time. The establishment of the town was as a result of the work undertaken by</p>

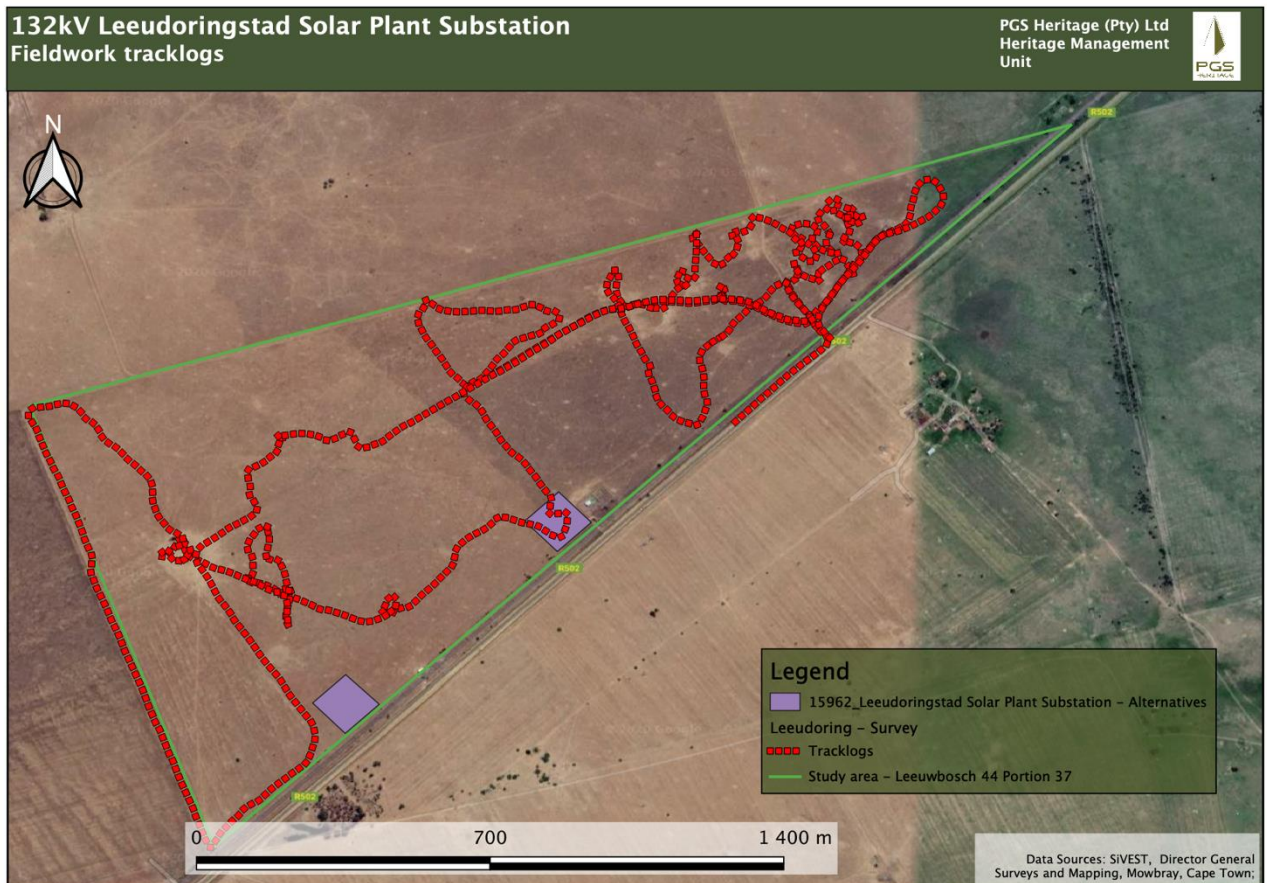
DATE	DESCRIPTION
	<p>local shopkeeper Charles Cherrie. The first health committee of the town had Cherry as chairman and R. Reid, J. Lamont, H. Bloch as well as P. Quin as members. The secretary was Jack Wride (Van Zijl, 1966).</p>
1911	<p>The discovery and proclamation of an extensive diamond field at Mooifontein (north-west of Bloemhof) in 1911 attracted roughly 5,000 people to these diggings with other 1,200 fortune seekers setting their sights on the Bloemhof townlands. By the end of the year the two fields had yielded more than 37,000 carats, a yield that was maintained for the following two years as well (Van Onselen, 1996).</p>
1914 - 1915	<p>Even before the outbreak of the First World War in 1914, the Union of South Africa's responsibility to Britain in such a war was the subject of a heated debate for quite some time. With the outbreak of hostilities, the South African Government of General Louis Botha notified Britain of their willingness to assist in the war effort.</p> <p>Many of the Afrikaans people found it intolerable that South Africa should assist their erstwhile enemy in her international conflicts and more so against a country with which they still had very strong ties. Subsequently many of them rose up in armed rebellion under the leadership of former Boer Generals such as Christiaan de Wet and J.C.G. Kemp. Another such a rebellion leader was Boer War leader General Christiaan Frederik Beyers who at the time was the commander of the Union Defence Force. After resigning his post, he became one of the leaders of the rebellion.</p> <p>He instructed the members of his commando that they should never be the first to shoot at government troops. As a result, he spent most of his time as rebel leader on the move to stay ahead of the government troops. Eventually his commando only comprised 25 men and they were chased without recourse from Kroonstad to the Vaal River. On the morning of 8 December 1914 government troops attacked the commando where they were camped in close vicinity to the Vaal River on the Free State farm Greyling's. In an attempt to allow their leader to escape, 23 members of the commando resisted while Beyers and Jan Pieterse tried to cross over the Vaal River on horseback. The river was however in flood and both men drowned (Van Zijl, 1966).</p> <p>As the South African government did not want to allow the family of General Beyers to bury him in Makwassie, he was buried in the Van Zijl family cemetery on the farm Oersonskraal 207 HO directly east of present-day Makwassie.. Pieterse was buried on the Free State side of the river (Möller, n.d.).</p>

DATE	DESCRIPTION
	Van Onselen (1996) indicates that on 1 November 1914 a skirmish took place between rebels under the command of P.J.K. van Vuuren and government troops on the farm Zoutpan 212 HO. Another skirmish took place shortly thereafter at the railway siding by the name of Kingswood.
October 1918	The Influenza Pandemic reached the general vicinity of the study area during this time. In his book <i>The Seed of Mine</i> Dr. Charles van Onselen (1996) relates how the crowded and unsanitary diamond diggings dotted across the wider landscape, resulted in large numbers of fatalities. At the diggings on the farms Kameelkuil 88 HO and London 112 hundreds of people died. One eyewitness account reveals how dozens of corpses were buried in mass graves near these diggings. As people starting leaving the diggings out of fear of getting infected, they brought the disease to their homesteads, villages and farms. Many of these returning workers also died along the roads on their way home and were often buried where they died. The farms themselves were also not immune to the disease and many people died as a result of it on the farms as well (Van Onselen, 1996).
1920	The Town Leeudoringstad was established.
1922	The diamond diggings in the wider vicinity were expanded in 1922 with the proclamation of Kareepoort 210 HO (with a number of other farms in the district which appears to have included Oersonskraal, Boskuil and Kareepan) as alluvial diggings. Thousands of white and black unemployed flocked to these diggings. On the farm Kareepoort a number of informal 'locations' comprising clusters of makeshift shanties and cabins sprung up. These included Fly Camp, Velskoen, Vuilkantien and Rooistad (Van Onselen, 1996).
1925	The northern portion of the farm Oersonskraal 250 HO was proclaimed an alluvial diggings (URU, 767, 2348).
1932	17 July 1932 when a train carrying 320 to 330 tons of dynamite from the De Beers factory at Somerset West to the Witwatersrand exploded and flattened the town of Leeudoringstad.
1940	The ruins of the mission station, which had been established, by Broadbent and Hodgson was proclaimed a Historical Monument (Bergh, 1998).



## 6. SPECIALIST FINDINGS / IDENTIFICATION AND ASSESSMENT OF IMPACTS

A selective survey of the study area was conducted on 13 September 2016 and a follow up visit on 23 April 2021. Due to the nature of cultural remains, with most artefacts occurring below surface, an archaeologist from PGS conducted a vehicle and foot-survey that covered the study area. The fieldwork was logged with a GPS to provide a tracklog of the area covered (**Figure 7**).



**Figure 7: Track logs showing analysis of study area**

The proposed study area is situated six kilometres (6km) north-east of the town of Leeudoringstad on the R502 between Leeudoringstad and Orkney, in the North West Province.

The proposed site is generally flat, with a slight gradient from west to east. Vegetation on the site is predominantly grassland currently utilized for grazing.



**Figure 8: View of north east section of site**



**Figure 9: View of south-western section of the site**

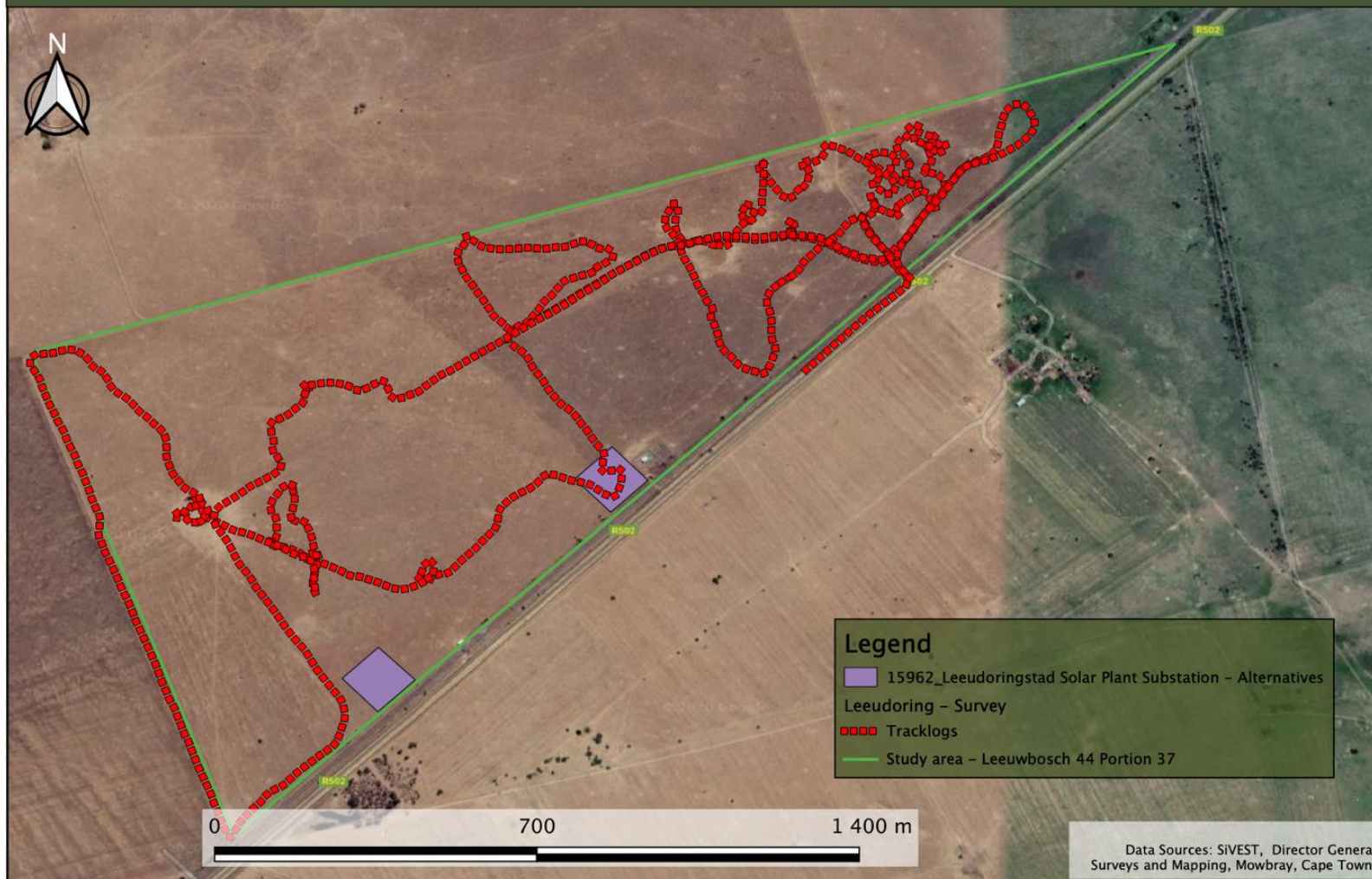


Figure 10: Track logs showing analysis of study area

# 132kV Leeudoringstad Solar Plant Substation Heritage Features

PGS Heritage (Pty) Ltd  
Heritage Management  
Unit

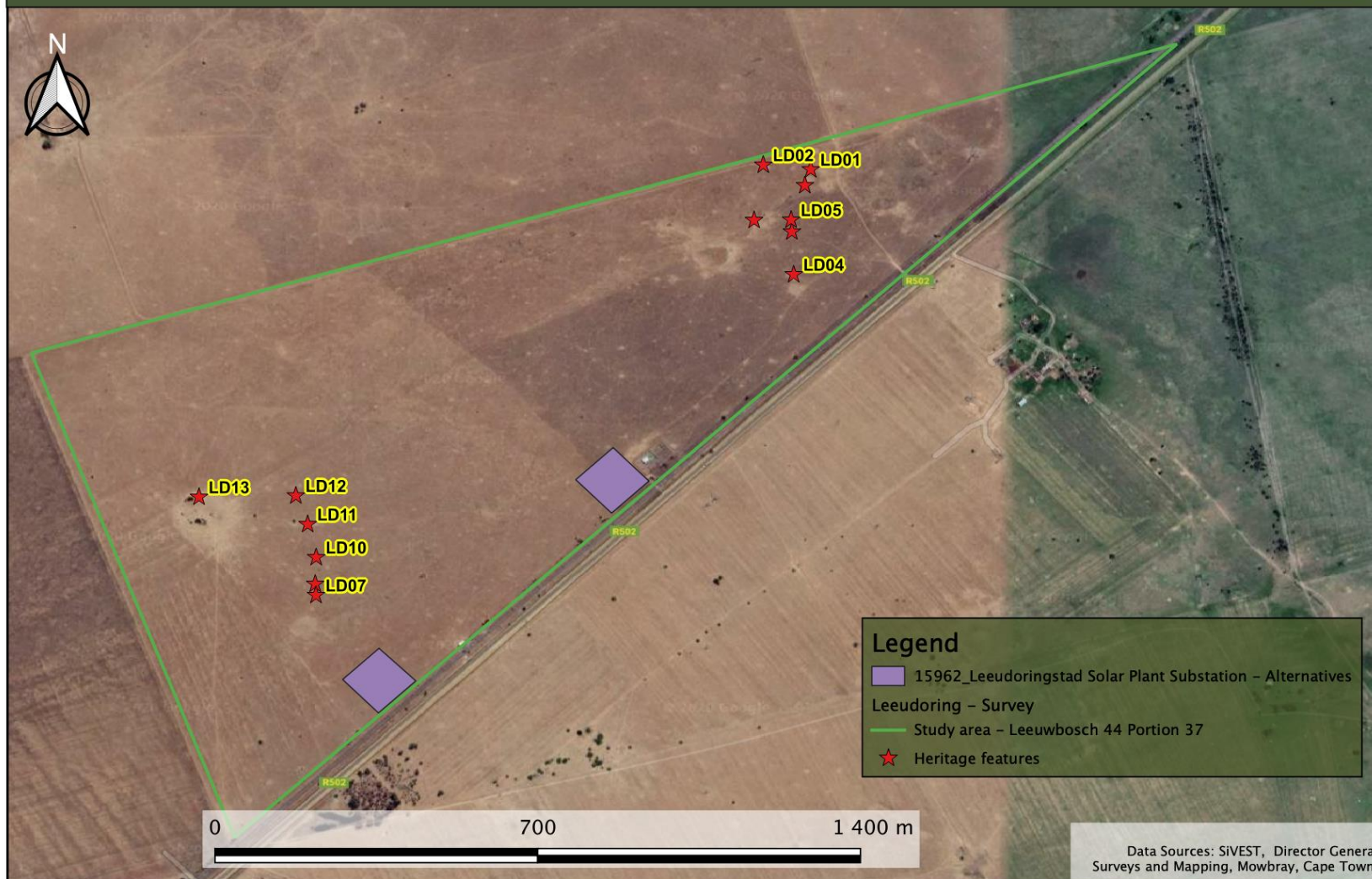







Figure 11: Heritage features in relation to the substation site alternatives



Table 2 below provides a description of the heritage resources identified in the study area.

Table 2: Heritage resources identified in study area




Site Number	Lat	Lon	Type Find	Description	Significance	Heritage Rating
LD01 LD03 LD04 LD05 LD06	S27.19787° S27.19886° S27.19992° S27.19886° S27.19909°	E26.31093° E26.30983° E26.31060° E26.31055° E26.31057°	Heritage Resource	<p>The concentration of structures is distributed of an area of 200x200 meters close to the north-eastern boundary of the study area. Most of the structures consist of a square single stone packed foundation. A single ash midden was identified close to LD06. The structures were most probably a concentration of labourer cottages. The cemetery at LD02 is in all probability associated with these structures. The structures in themselves are of low heritage significance, but the possibility of infant burials close to or in the remaining foundations as per African custom cannot be excluded. The resources are graded as having medium local heritage significance.</p> <p><b>It is recommended that further consultation with local communities on the previous inhabitants of these areas be initiated to determine the possibility of infant burials. In the event that such burial is confirmed a grave relocation process must be initiated.</b></p> <p><b>It is further recommended that an archaeologist monitor the earth moving activities during construction.</b></p>	Medium to Low	IIIC

Site Number	Lat	Lon	Type Find	Description	Significance	Heritage Rating
				  		
				<p><b>Figure 12: Foundation at LD01</b></p> <p><b>Figure 13: Foundation of kraal at LD03</b></p> <p><b>Figure 14: Paved entrance at LD05</b></p>		
LD02	-29.842418	22.410477	Heritage Resource	<p>The resource is a burial ground situated just south of the northern boundary fence of the study area. The burial ground consists of approximately 10 graves. All of the graves are aligned east-west and are stone packed with no formal headstones. The graves are aligned in three rows in an area of approximately 10 x 10 meters.</p> <p>The heritage resource has of high local significance and is graded as IIIA</p> <p><b>It is recommended that the site be preserve and a buffer fence of 20 meters constructed around the site.</b></p> <p><b>Grave relocation must only be considered as last resort. A detailed relocation process must be followed and it is recommended that an experienced consultant be appointed to manage the relocation process.</b></p>	High	IIIA

Site Number	Lat	Lon	Type Find	Description	Significance	Heritage Rating
				 		
				<p><b>Figure 15: View of LD02 from the east</b></p> <p><b>Figure 16: Close-up view of LD02</b></p>		
LD07 LD09 LD10 LD11 LD12	S27.20617° S27.20595° S27.20543° S27.20479° S27.20423°	E26.30130° E26.30128° E26.30130° E26.30113° E26.30090°	Heritage Resource	<p>The concentration of structures is distributed of an area of 300x100 meters in the western section of the study area. Most of the structures consist of a square single stone packed foundation. A few small ash middens were identified close to each of the structures. The structures were most probably a concentration of labourer cottages. The structures in themselves are of low heritage significance, but the possibility of infant burials close to or in the remaining foundations as per African custom cannot be excluded. The resources are graded as having medium local heritage significance.</p> <p><b>It is recommended that further consultation with local communities on the previous inhabitants of these areas be initiated to determine the possibility of infant burials. In the event that such burial is confirmed a grave relocation process must be initiated.</b></p>	Medium to Low	IIIC

Site Number	Lat	Lon	Type Find	Description	Significance	Heritage Rating
				It is further recommended that an archaeologist monitor the earth moving activities during construction.		
						
<p><b>Figure 17: Foundation at LD07</b></p>				<p><b>Figure 18: Foundation of kraal at LD09</b></p>		
LD13	S27.20426°	E26.29902°	Heritage Resource	<p>The resource is a recent historic handling kraal. The site consists of a wind pump, cement water dam, feeding and water troughs, loading ramps and corner posts for a kraal.</p> <p>The site is dated to 1954, as a date inscription on one of the feeding troughs reads – “10-2-1954”. The site is of medium local heritage significance and graded as IIIC.</p> <p><b>The site is older than 60 years and protected under section 34 of the NHRA. It is recommended that the site be documented by means of a layout drawing and photographic documentation after which a destruction permit must be applied for from the North West Provincial Heritage Authority prior to destruction.</b></p>	Medium	IIIC



Site Number	Lat	Lon	Type Find	Description	Significance	Heritage Rating
 <p data-bbox="208 708 683 735">Figure 19: View of LD13 from the east</p>	 <p data-bbox="869 697 1514 754">Figure 20: Loading ramp, with dam and wind pump in background</p>	 <p data-bbox="1541 730 2013 758">Figure 21: Date inscription on trough</p>				

The fieldwork identified no heritage resources close to either of the substation site alternatives.

## 6.1 Palaeontology

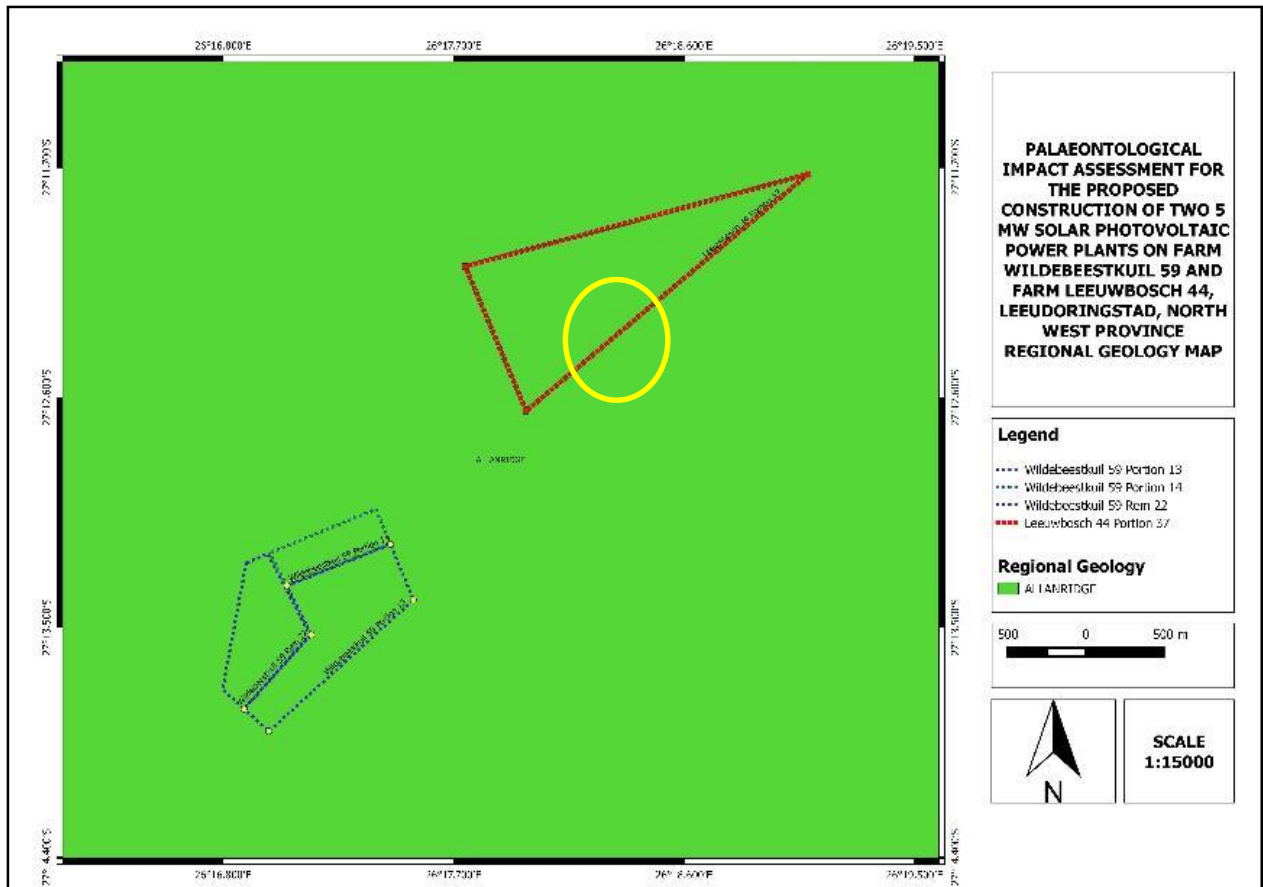
Banzai Environmental (Pty) Ltd, the appointed palaeontologist for this project, completed a desktop assessment (Butler, 2020).

The following section is extracted from their report.

*“The development footprint is underlain by the Allanridge Formation (Ventersdorp Supergroup). The Ventersdorp Supergroup characterise a major occurrence of igneous extrusion that is associated with fracturing of the Kaapvaal Craton approximately 2.7 Ga (billion years) ago. The Late Archaean Allanridge succession is almost fully composed of resistant-weathering, dark green lavas and associated pyroclastic rocks.*

*The ancient basement rocks, including the Allanridge Formation, are not known to be fossiliferous and thus there is no possibility that the rocks of the Allanridge Formation will contain any fossils. **Thus, the construction and operation of the Leeuwbosch 1 Solar PV Plant and Leeuwbosch 2 Solar PV Plant may be authorized as the whole extent of the development footprint is not considered as sensitive in terms of palaeontological resources.**”*

This statement is thus true for the substation site alternatives as they fall within the same application site (namely Portion 37 of the farm Leeuwbosch No.44) as the Leeuwbosch 1 Solar PV Plant and Leeuwbosch 2 Solar PV Plant projects (part of separate respective BA processes) and subject to the same geology.



**Figure 22: The surface geology of the proposed Leeuwbosch 1 Solar PV Plant and Leeuwbosch 2 Solar PV Plant on farm Leeuwbosch 44, Leeudoringstad, Maquassi Hills Local Municipality, North West Province (Substation areas in yellow circle)**

## 6.2 Cumulative Impacts

This section evaluates the possible cumulative impacts (CI) on heritage resources with the addition of the Leeudoringstad Solar Plant Substation. The CI on heritage resources evaluated a 50-kilometer radius (**Figure 23**). **Table 3** below lists the projects that will need to be considered when examining the cumulative impacts.

**Table 3: Proposed Renewable Energy Projects in the Area**

Proposed Development	Reference Number	Current Status of BA / EIA	Proponent	Proposed Capacity	Farm Details
Leeuwbosch 1 Solar PV Plant Project	TBA	BA ongoing	Leeuwbosch PV Generation (Pty) Ltd	9.9MW	Farm Leeuwbosch 44
Leeuwbosch 2 Solar PV Plant Project	TBA	BA ongoing	Leeuwbosch PV Generation (Pty) Ltd	9.9MW	Farm Leeuwbosch 44
Wildebeestkuil 1 Solar PV Plant Project	TBA	BA ongoing	Wildebeestkuil PV Generation (Pty) Ltd	9.9MW	Farm Wildebeestkuil 59
Wildebeestkuil 2 Solar PV Plant Project	TBA	BA ongoing	Wildebeestkuil PV Generation (Pty) Ltd	9.9MW	Farm Wildebeestkuil 59
Bokamoso Solar Energy Facility	14/12/16/3/3/2/559	Project has received environmental authorisation	SunEdison	75MW	A portion of the farm Matjesspruit 145

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 Komsberg region. Although various studies were done in the past 10 years the combined coverage of the Komsberg region is still sparse and due to the vastness of the area not representative. 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. Almond (2020) further reiterates that cumulative impacts must be done on comparable fossil assemblages present in the same formations in a stud area as well as the broader region;
- **Defined thresholds:** The value judgement on the significance of a heritage site will vary from individual to individual and between interest groups. Thus, implicating that heritage resources' significance can and does change over time. And so, will the tipping threshold for impacts on a certain type of heritage resource; and
- **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).

The cumulative impact that is foreseen is on the cultural landscape with the implementation of an additional solar project in the region. There are areas within the region with concentrations of archaeological remains such as Iron Age Sites or rock engravings. The historical buildings illustrate the specific culture of the area as well as further insight into the historical background of the area's development. Destruction of this historical landscape will dispossess the region of its heritage. However, the area is not seen as a major tourism zone, the archaeology is sporadic and many of the historical structures are in a state of disrepair.

The area has seen a notable interest from developers of various renewable energy projects, which could be associated with the solar energy resource potential found in the region, proximity to the existing sub-station



**Table 4: Impact rating table**

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
<b>Construction and decommissioning Phase</b>																				
Impact on heritage resources	Site clearance and vegetation stripping	1	1	4	1	3	1	10	-	Low	Implement a chance finds procedures handle any heritage resources discovered during construction	1	1	4	1	3	1	10	-	Low
<b>Cumulative</b>																				
Impact on heritage resources	Site clearance and vegetation stripping	1	1	4	1	3	1	10	-	Low	Implement a chance finds procedures handle any heritage resources discovered during construction	1	1	4	1	3	1	10	-	Low

## 7. COMPARATIVE ASSESSMENT OF ALTERNATIVES

As mentioned, two different location alternatives for the substation site were identified and assessed. The two alternative positions of the substation were considered during the site visit and impact assessment.

**Table 5: Combined Comparative Assessment of layout Alternatives**

### Key to Table 5

<b>PREFERRED</b>	The alternative will result in a low impact / reduce the impact / result in a positive impact
<b>FAVOURABLE</b>	The impact will be relatively insignificant
<b>LEAST PREFERRED</b>	The alternative will result in a high impact / increase the impact
<b>NO PREFERENCE</b>	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
<b>Substation</b>		
Option 1	NO PREFERENCE	No heritage resources will be affected by this position
Option 2	NO PREFERENCE	No heritage resources will be affected by this position

Based on the results of the comparative assessment of alternatives in the table above, it is our opinion that no preference for either of the substation site alternatives exist as both will have the same low impact on heritage resources.

### 7.1 No-Go Alternative

It is mandatory to consider the “no-go” option in the BA process. The no development alternative option assumes the site remains in its current state, i.e. there is no construction of a substation in the proposed project area and the *status quo* would continue.

## 8. CONCLUSION

PGS was appointed by SiVEST to undertake a Heritage Impact Report that forms part of the Environmental Basic Assessment (BA) for Leeudoringstad Solar Plant (Pty) Ltd for the proposed construction of the 132/11kV Leeudoringstad Solar Plant Substation, on Portion 37 the farm Leeuwbosch No. 44, near Leeudoringstad, Maquassi Hills Local Municipality North West Province.

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

The fieldwork identified 13 heritage resources in the greater study area of the greater Leeudoringstad Solar PV Project<sup>6</sup>, however, none of the heritage resources identified are close to either of the substation site alternatives associated with this proposed substation development.

## 8.1 Mitigation measures

The following mitigation is suggested to reduce impacts on heritage resources:

### Palaeontology:

- No mitigation measures are required.

### Archaeological Sites:

- For sites LD01, LD03, LD04, LD05, LD06 and LD07, LD09, LD10, LD11 LD12 the current 20-meter buffer should be kept in place.
- We further recommend that an archaeologist monitor the earth moving activities during construction.
- We recommend that the burial site LD02 be preserved and a buffer fence of 30 meters, as per SAHRA policies, constructed around the site.

## 8.2 Impact Statement

The two alternative positions of the substation were considered during the site visit and impact assessment. It is our opinion that no preference for either of the sites exist as both will have the same low impact as assessed on heritage resources.

If heritage resources are discovered during site clearance, construction activities must stop in the vicinity, and a qualified archaeologist must be appointed to evaluate and make recommendations on mitigation measures.

The overall impact of the Leeudoringstad Solar Plant Substation, on the heritage resources identified during this report, is seen as acceptably low after the recommendations have been implemented and therefore, impacts can be mitigated to acceptable levels allowing for the development to be authorised.

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<sup>6</sup> Greater Leeudoringstad Solar PV Project consists of Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line, Wildebeestkuil 2 Solar PV Plant & 132kV Power Line and 132/11kV Leeudoringstad Solar Plant Substation (this project).



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## 9.2 Internet References

[www.wikipedia.org](http://www.wikipedia.org)



## Appendix A

# Heritage Assessment Methodology

The applicable maps, tables and figures are included, as stipulated in the NHRA (Act No 25 of 1999) and NEMA (Act 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 predominantly by foot within the proposed areas by two qualified archaeologists, which aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

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

The significance of identified heritage sites are 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/High - 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 development activity position;

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

E - Preserve site.

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

#### **Site significance classification standards as prescribed by HWC.**

Site significance classification standards use is based on the heritage classification of s3 in the NHRA and developed for implementation keeping in mind the grading system approved by SAHRA for archaeological impact assessments. The update classification and rating system as developed by Heritage Western Cape (2016) is implemented in this report

Site significance classification standards prescribed by the Heritage Western Cape Guideline (2016), were used for the purpose of this report (**Table 6** and **Table 7**).

#### **Table 6: Rating system for archaeological resources**

<b>Grading</b>	<b>Description of Resource</b>	<b>Examples of Possible Management Strategies</b>	<b>Heritage Significance</b>
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Langebaanweg (West Coast Fossil Park), Cradle of Humankind	May be declared as a National Heritage Site managed by SAHRA. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Highest Significance
II	Heritage resources with special qualities which make them significant, but do not fulfil the criteria for Grade I status. Current examples: Blombos, Paternoster Midden.	May be declared as a Provincial Heritage Site managed by HWC. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Exceptionally High Significance
III	Heritage resources that contribute to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. Current examples: Varschedrift; Peers Cave; Brobartia Road Midden at Bettys Bay	Resource must be retained. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree.	Resource must be retained where possible where not possible it must be fully investigated and/or mitigated.	Medium Significance
IIIC	Such a resource is of contributing significance.	Resource must be satisfactorily studied before impact. If the recording already done (such as in an HIA or permit application) is not sufficient, further recording or even mitigation may be required.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No further actions under the NHRA are required. This must be motivated by the applicant or the consultant and approved by the authority.	No research potential or other cultural significance

**Table 7 - Rating system for built environment resources**

<b>Grading</b>	<b>Description of Resource</b>	<b>Examples of Possible Management Strategies</b>	<b>Heritage Significance</b>
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Robben Island	May be declared as a National Heritage Site managed by SAHRA.	Highest Significance
II	Heritage resources with special qualities which make them significant in the context of a province or region, but do not fulfil the criteria for Grade I status.	May be declared as a Provincial Heritage Site managed by HWC.	Exceptionally High Significance

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
	Current examples: St George's Cathedral, Community House		
II	Such a resource contributes to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. These are heritage resources which are significant in the context of an area.	This grading is applied to buildings and sites that have sufficient intrinsic significance to be regarded as local heritage resources; and are significant enough to warrant that any alteration, both internal and external, is regulated. Such buildings and sites may be representative, being excellent examples of their kind, or may be rare. In either case, they should receive maximum protection at local level.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree. These are heritage resources which are significant in the context of a townscape, neighbourhood, settlement or community.	Like Grade IIIA buildings and sites, such buildings and sites may be representative, being excellent examples of their kind, or may be rare, but less so than Grade IIIA examples. They would receive less stringent protection than Grade IIIA buildings and sites at local level.	Medium Significance
IIIC	Such a resource is of contributing significance to the environs. These are heritage resources which are significant in the context of a streetscape or direct neighbourhood.	This grading is applied to buildings and/or sites whose significance is contextual, i.e. in large part due to its contribution to the character or significance of the environs. These buildings and sites should, as a consequence, only be regulated if the significance of the environs is sufficient to warrant protective measures, regardless of whether the site falls within a Conservation or Heritage Area. Internal alterations should not necessarily be regulated.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to	No further actions under the NHRA are required. This must be motivated by the applicant and approved by the authority. Section 34 can	No research potential or other cultural significance

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
	be retained as part of the National Estate.	even be lifted by HWC for structures in this category if they are older than 60 years.	



## Appendix B

# The Impact Assessment Scales used for this project



# 1 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) METHODOLOGY

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

## 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 8**.

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

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

- Planning;
- Construction;
- Operation; and
- 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 possible mitigation of the impact. Impacts have been consolidated into one (1) rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

**Table 8: Rating of impacts criteria**

ENVIRONMENTAL PARAMETER
-------------------------

A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
<b>ISSUE / IMPACT / ENVIRONMENTAL EFFECT / 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 (e.g. oil spill in surface water).		
<b>EXTENT (E)</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 (P)</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 (R)</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 (L)</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.
<b>DURATION (D)</b>		

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).
<b>INTENSITY / MAGNITUDE (I / M)</b>		
Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
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 (S)

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:

$$\text{Significance} = (\text{Extent} + \text{probability} + \text{reversibility} + \text{irreplaceability} + \text{duration}) \times \text{magnitude/intensity.}$$

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.

Points	Impact Rating	Significance	Description
5 to 23	Negative Low impact		The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact		The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact		The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact		The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact		The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact		The anticipated impact will have significant positive effects.
62 to 80	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".
62 to 80	Positive Very high impact		The anticipated impact will have highly significant positive effects.



## Appendix C

# Project team CV's

## WOUTER FOURIE

### Professional Heritage Specialist and Professional Archaeologist and Director PGS Heritage

#### Summary of Experience

Specialised expertise in Archaeological Mitigation and excavations, Cultural Resource Management and Heritage Impact Assessment Management, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management, Geographic Information Systems, including *inter alia* -

Involvement in various grave relocation projects (some of which relocated up to 1000 graves) and grave “rescue” excavations in the various provinces of South Africa

Involvement with various Heritage Impact Assessments, within South Africa, including -

- Archaeological Walkdowns for various projects
- Phase 2 Heritage Impact Assessments and EMPs for various projects
- Heritage Impact Assessments for various projects
- Iron Age Mitigation Work for various projects, including archaeological excavations and monitoring
- Involvement with various Heritage Impact Assessments, outside South Africa, including -
- Archaeological Studies in Democratic Republic of Congo
- Heritage Impact Assessments in Mozambique, Botswana and DRC
- Grave Relocation project in DRC

#### Key Qualifications

BA [Hons] (Cum laude) - Archaeology and Geography - 1997

BA - Archaeology, Geography and Anthropology - 1996

Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA) - Professional Member

Accredited Professional Heritage Specialist – Association of Professional Heritage Practitioners (APHP)

CRM Accreditation (ASAPA) -

Principal Investigator - Grave Relocations

Field Director – Iron Age

Field Supervisor – Colonial Period and Stone Age

Accredited with Amafa KZN

#### Key Work Experience

2003- current - Director – Professional Grave Solutions (Pty) Ltd

2007 – 2008 - Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand

2005-2007 - Director – Matakoma Heritage Consultants (Pty) Ltd

2000-2004 - CEO– Matakoma Consultants

1998-2000 - Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng

1997-1998 - Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng

Worked on various heritage projects in the SADC region including, Botswana, Mozambique, Malawi, Mauritius and the Democratic Republic of the Congo



## Appendix D

# Terms of Reference (Tor) for Specialist Studies

# **PROPOSED DEVELOPMENT OF THE 132/11kV LEEUDORINGSTAD SOLAR PLANT SUBSTATION NEAR LEEUDORINGSTAD IN THE NORTH WEST PROVINCE, MAQUASSI HILLS LOCAL MUNICIPALITY IN THE DR KENNETH KAUNDA DISTRICT MUNICIPALITY**

## **TERMS OF REFERENCE (ToR) FOR SPECIALIST STUDIES**

### **1. INTRODUCTION**

The purpose of the Terms of Reference (ToR) is to provide the specialist team with a consistent approach to the specialist studies that are required as part of the Basic Assessment (BA) process being conducted in respect of the proposed substation development. This will enable comparison of environmental impacts, efficient review, and collation of the specialist studies into the BA report, in accordance with the latest requirements of the EIA Regulations, 2014 (as amended).

### **2. PROCESS**

In terms of the Environmental Impact Assessment (EIA) Regulations, which were published on 04 December 2014 and amended on 07 April 2017 [promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R324 on 7 April 2017], various aspects of the proposed development are considered listed activities under GNR 327 and GNR 324 (this project is considered a BA process due to energy capacity thresholds of more than 33kV but less than 275kV and vegetation clearance thresholds of under 20ha), which may have an impact on the environment and therefore require authorisation from the provincial competent authority, namely the North West Department of Economic Development, Environment, Conservation and Tourism (NW DEDECT), prior to the commencement of such activities.

### **3. PROJECT DESCRIPTION**

#### **3.1 Project History**

The original BA process for the proposed Leeudoringstad Solar Plant Substation was initiated in August 2016. All specialist studies were undertaken and subsequently all site sensitivities were identified. The specialist studies and draft basic assessment reports (DBARs) were completed and released for 30-day public review. The BA was however put out on hold prior to submitting the final basic assessment reports (FBARs) to the Department of Environmental Affairs (DEA). In February 2017, the proposed capacity and location of the substation was amended, and a new connection point was assessed. However, the project was put on hold prior to submitting the application forms to the DEA or commencing with the legislated public participation process. In August of 2020, Leeudoringstad Solar Plant Substation proposed a new substation site (now referred to as the Leeudoringstad Solar Plant Substation) outside of all site sensitivities that were identified in



2016, and as such specialist studies have been commissioned to assess and verify the substation under the new Gazetted specialist protocols<sup>7</sup>.

### 3.2 Project Location

Leeudoringstad Solar Plant (Pty) Ltd (hereafter referred to as “Leeudoringstad Solar Plant”) is proposing to construct a substation approximately 7km north-east of the town of Leeudoringstad in the Maquassi Hills Local Municipality, which falls within the Dr Kenneth Kaunda District Municipality in the North West Province of South Africa (hereafter referred to as the “proposed development”) (Department Ref No.: To be Allocated). The proposed development will have a capacity of 132/11 kilovolts (kV) and will be referred to as the Leeudoringstad Solar Plant Substation. SiVEST Environmental Division (hereafter referred to as “SiVEST”) has subsequently been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the BA process for the proposed construction of the Leeudoringstad Solar Plant Substation. The overall objective of the proposed development is to feed the electricity generated by the proposed Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line (part of separate respective on-going BA processes) into the national grid and “wheel” the power to customers based on a power purchase agreement. Additionally, an agreement is in place to sell the energy to PowerX, who hold a National Energy Regulator of South Africa (NERSA)-issued electricity trading license which allows them to purchase energy generated from clean and renewable resources and sell it to its customers.

The proposed substation will be located on the following property:

- Portion 37 of the Farm Leeuwbosch No. 44.

The above-mentioned property is approximately 124.691 hectares (ha) in extent. The proposed substation assessed as part of this BA will however only cover an area of up to approximately 10 016m<sup>2</sup> (≈1ha).

The proposed development is located directly west of the Harvard Substation, where the current supply of electricity for the local areas and businesses is extracted from.

### 3.3 Substation Components

At this stage, it is anticipated that the proposed development will include the following components:

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<sup>7</sup> GOVERNMENT GAZETTE No. 43110, PROCEDURES FOR THE ASSESSMENT AND MINIMUM CRITERIA FOR REPORTING ON IDENTIFIED ENVIRONMENTAL THEMES IN TERMS OF SECTIONS 24(5)(a) AND (h) AND 44 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998, WHEN APPLYING FOR ENVIRONMENTAL AUTHORISATION, 20 MARCH 2020.

In terms of sections 24(5)(a), (h) and 44 of the National Environmental Management Act, 1998, prescribe general requirements for undertaking site sensitivity verification and for protocols for the assessment and minimum report content requirements of environmental impacts for environmental themes for activities requiring environmental authorisation, as contained in the Schedule hereto. When the requirements of a protocol apply, the requirements of Appendix 6 of the Environmental Impact Assessment Regulations, as amended, (EIA Regulations), promulgated under sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), are replaced by these requirements. Each protocol applies exclusively to the environmental theme identified within its scope. Multiple themes may apply to a single application for environmental authorisation, and assessments for these themes must be undertaken in accordance with the relevant protocol, or where no specific protocol has been prescribed, in accordance with the requirements of the EIA Regulations.

- One (1) new 132/11kV substation (namely the Leeudoringstad Solar Plant Substation) to serve the Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line (part of separate respective BA processes).

Once fully developed, the intention is to feed the electricity generated by the proposed Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line (part of separate respective BA processes) into the national grid and “wheel” the power to customers based on a power purchase agreement. Additionally, an agreement is in place to sell the energy to PowerX, who hold a NERSA-issued electricity trading license which allows them to purchase energy generated from clean and renewable resources and sell it to its customers.

The construction phase will be between 12 and 24 months and the operational lifespan will be approximately 20 years, depending on the length of the power purchase agreement with the relevant off taker.

## **4. BA ALTERNATIVES**

### **4.1 Location alternatives**

No site alternatives for this proposed development were considered as the placement of the proposed substation is dependent on the location of the proposed Leeuwbosch 1 Solar PV Plant, Leeuwbosch 2 Solar PV Plant, Wildebeestkuil 1 Solar PV Plant & 132kV Power Line and Wildebeestkuil 2 Solar PV Plant & 132kV Power Line (part of a separate BA processes).

### **4.2 Technology alternatives**

No other activity / technology alternatives are being considered. Renewable energy development in South Africa is highly desirable from a social, environmental and development point of view. Based on the flat terrain, the climatic conditions and current land use being agricultural, it was determined that the proposed site would be best-suited for a substation associated with a solar PV plant, instead of any other type of renewable energy technology. It is generally preferred to install wind energy facilities (WEFs) on elevated ground. In addition, concentrated solar power (CSP) installations are not feasible because they have a high water requirement and the project site is located in a relatively arid area. There is also not enough rainfall in the area to justify a hydro-electric plant. Therefore, the only feasible technology alternative on this site is solar PV with an associated substation and as such this is the only technology alternative being considered.

### **4.3 Layout alternatives**

Design and layout alternatives were considered and assessed as part of a previous BA process that was never completed, as such the substation site has been placed to avoid site sensitivities identified as part of a previous BA process as well as the current BA process. Specialist studies were originally undertaken in 2016 and all current layouts and/or positions being proposed were selected based on the environmental sensitivities identified as part of these studies in 2016. All specialist studies which were undertaken in 2016 were however updated in 2020 (including ground-truthing, where required) to focus on the impacts of the layout being

proposed as part of the current project. The results of the updated specialist assessments have informed the layout being proposed as part of the current BA process. The proposed substation site has therefore been informed by the identified environmental sensitive and/or “no-go” areas.

Two (2) different location alternatives for the substation site were however identified and assessed as part of the current BA process.

#### **4.4 The operational aspects of the activity**

No operational alternatives were assessed in the BA, as none are available for substations.

#### **4.5 “No-go” alternative**

The “no-go” alternative is the option of not fulfilling the proposed project. This alternative would result in no environmental impacts from the proposed project on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report. Implementing the “no-go” option would entail no development.

The “no-go” option is a feasible option; however, this would prevent the Leeudoringstad Solar Plant Substation from contributing to the environmental, social and economic benefits associated with the development of the renewables sector.

### **5. SPECIALIST REPORT REQUIREMENTS**

The specialist assessments should include the following sections:

#### **5.1 Project Description**

The specialist report must include the project description as provided above.

#### **5.2 Terms of Reference (ToR)**

The specialist report must include an explanation of the Terms of Reference (ToR) applicable to the specialist study. In addition, a table must be provided at the beginning of the specialist report listing the requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations, 2014 (as amended) and cross referencing these requirements with the relevant sections in the report. An MS Word version of this table will be provided by SiVEST.

#### **5.3 Legal Requirements and Guidelines**

The specialist report must include a thorough overview of all applicable best practice guidelines, relevant legislation and authority requirements.

## 5.4 Methodology

The report must include a description of the methodology applied in carrying out the specialist assessment.

## 5.5 Specialist Findings / Identification of Impacts

The report must present the findings of the specialist studies and explain the implications of these findings for the proposed development (e.g. permits, licenses etc.). This section of the report should also identify any sensitive and/or 'no-go' areas on the development site which should be avoided.

The reports should be accompanied with spatial datasets (shapefiles, KML) and accompanying text documents if required.

## 5.6 Impact Rating Methodology

The impacts of the proposed substation (during the Construction, Operation and Decommissioning phases) are to be assessed and rated according to the methodology developed by SiVEST. Specialists will be required to make use of the impact rating matrix provided (in Excel format) for this purpose. Please note that the significance of Cumulative Impacts should also be rated in this section. Both the methodology and the rating matrix will be provided by SiVEST.

Please be advised that this section must include mitigation measures aimed at minimising the impact of the proposed development.

## 5.7 Input to The Environmental Management Program (EMPr)

The report must include a description of the key monitoring recommendations for each applicable mitigation measure identified for each phase of the proposed development for inclusion in the Environmental Management Program (EMPr) or Environmental Authorisation (EA).

Please make use the Impact Rating Table (in Excel format) provided for each of the phases (i.e. Design, Construction, Operation and Decommissioning).

## 5.8 Cumulative Impact Assessment

Cumulative impact assessments must be undertaken for the proposed substation in order to determine the cumulative impact that will materialise should other Renewable Energy Facilities (REFs), associated substations and large-scale industrial developments be constructed within 50km of the proposed development.

The cumulative impact assessment must contain the following:

- A cumulative environmental impact statement noting whether the overall impact is acceptable; and
- A review of the specialist reports undertaken for other REFs and an indication of how the recommendations, mitigation measures and conclusion of the studies have been considered.

In order to assist the specialists in this regard, SIVEST will provide the following documentation / data:

- A summary table listing all REFs identified within 50km of the proposed substation;
- A map showing the location of the identified REFs;
- KML files; and
- Relevant EIA / BA reports that could be obtained.

The list of renewable energy facilities that must be assessed as part of the cumulative impact will be provided.

## 5.9 “No Go” Alternative

Consideration must be given to the “no-go” option in the BA process. The “no-go” option assumes that the site remains in its current state, i.e. there is no construction of a substation in the proposed project area and the *status quo* would proceed.

## 5.10 Comparative Assessment of Alternatives

As mentioned, design and layout alternatives, which subsequently informed the area for the potential construction of the proposed substation, were identified and comparatively assessed as part of the BA process undertaken in 2016. In addition, despite that fact that the position of the proposed substation has already been determined taking the identified environmental sensitive and/or “no-go” areas into consideration, two (2) different location alternatives for the substation site were identified and assessed by the respective specialists as part of this BA process. As such, the specialist is to undertake a comparative assessment of substation site alternatives as per the latest table provided by SIVEST.

### Key

<b>PREFERRED</b>	The alternative will result in a low impact / reduce the impact / result in a positive impact
<b>FAVOURABLE</b>	The impact will be relatively insignificant
<b>LEAST PREFERRED</b>	The alternative will result in a high impact / increase the impact
<b>NO PREFERENCE</b>	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
<b>Substation</b>		
Option 1		
Option 2		

## 5.11 Conclusion / Impact Statement

The conclusion section of the specialist reports must include an **Impact Statement**, indicating whether any fatal flaws have been identified and ultimately whether the proposed development can be authorised or not (i.e. whether EA should be granted / issued or not).

## 5.12 Executive Summary

Specialists must provide an Executive Summary which summarises the findings of their report to allow for easy inclusion in the BA reports.

## 6. DELIVERABLES

All specialists will need to submit the following deliverables:

- 1 x Draft Specialist Report for inclusion in DBAR no later than 07 September 2020 and updated version based on EAP and applicant review no later than 11 September 2020;
- 1 x Final Specialist Report for inclusion in FBAR (should updates and/or revisions be required);
- A copy of the Specialist Declaration of Interest (DoI) form, containing original signatures. This form will be provided to the specialists. **Please note that the undertaking / affirmation under oath section of the report must be signed by a Commissioner of Oaths;** and
- All data relating to the studies, such as shape files, photos and maps (see **Section 7** below).

## 7. GENERAL SUBMISSION REQUIREMENTS

Please ensure that your specialist report includes the following:

- A detailed description of the study's methodology; indication of the locations and descriptions of the development footprint, and all other associated infrastructures that they have assessed and are recommending for authorisations;
- Provide a detailed description of all limitations to the studies. All specialist studies must be conducted in the correct season and providing that as a limitation will not be allowed;
- All specialist studies must be final, and provide detailed / practical mitigation measures for the preferred alternative and recommendations, and must not recommend further studies to be completed post EA;
- Should a specialist recommend specific mitigation measures, these must be clearly indicated;
- Regarding cumulative impacts:
  - Clearly defined cumulative impacts and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.
  - A detailed process flow to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project.
  - Identified cumulative impacts associated with the proposed development must be rated with the significance rating methodology used in the process.
  - The significance rating must also inform the need and desirability of the proposed development.
  - A cumulative impact environmental statement on whether the proposed development must proceed

- The report must in line with the DFFE Screening Tool Specialist Theme Protocols (As gazetted 20 March 2020), if they apply. If they do not, the report must be written in accordance with Appendix 6 of the EIA Regulations, 2014 (as amended);
- A table at the beginning of your report cross referencing how the requirements for specialist according to Appendix 6 of the EIA Regulations, 2014 (as amended) has been adhered to. An MS Word version will be provided;
- A thorough overview of all applicable legislation, policies, guidelines. etc.;
- Identification of sensitive and/or “no-go” areas to be avoided;
- Please note that the Department considers a “no-go” area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure is allowed in the “no-go” areas;
- Should the specialist definition of “no-go” area differ from the Departments definition; this must be clearly indicated. The specialist must also indicate the “no-go” area's buffer if applicable;
- Recommend mitigation measures in order to minimise the impact of the proposed development;
- Provide implications of specialist findings for the proposed development (e.g. permits, licenses etc.);
- Specify if any further assessment will be required;
- Include an Impact Statement, concluding whether any fatal flaws have been identified and ultimately whether the proposed development can be authorised or not (i.e. whether EA should be granted / issued or not); and
- A copy of the Specialist Declaration of Interest (DoI) form, containing original signatures, must be appended to all Draft and Final Reports. This form will be provided to the specialists. **Please note that the undertaking / affirmation under oath section of the report must be signed by a Commissioner of Oaths.**

## 8. DEADLINES AND REPORT SUBMISSION

- Draft Specialist Report for inclusion in DBAR no later than 07 September 2020 and updated version based on EAP and applicant review no later than 11 September 2020.
- Any changes arising based on stakeholder engagement no later than 16 October 2020

## 9. REPORT / DATA FORMATS

- All specialist reports must be provided in MS Word format;
- Where maps have been inserted into the report, SiVEST will require a separate map set in PDF format for inclusion in our submission;
- Where figures and/or photos have been inserted into the report, SiVEST will require the original graphic in .jpg format for inclusion in our submission; and
- ***Delineated areas of sensitivity must be provided in either ESRI shape file format or Google Earth KML format. Sensitivity classes must be included in the attribute tables with a clear indication of which areas are “No-Go” areas.***

## 10. SPECIALIST SPECIFIC ISSUES

### Heritage

- Describe and map the heritage features of the site and surrounding area. This is to be based on desk-top reviews, fieldwork, available databases, and findings from other heritage studies in the area, where relevant. Include reference to the grade of heritage feature and any heritage status the feature may have been awarded;
- Assess the impacts and provide mitigation measures to include in the environmental management plan;
- Map heritage sensitivity for the site. Clearly show any “no-go” areas in terms of heritage (i.e. “very high” sensitivity) and provide recommended buffers or set-back distances;
- Identify and assess potential impacts from the project on the full scope of heritage features, including archaeology, palaeontology and the cultural-historical landscape, as required by heritage legislation;
- Liaise with the relevant authority in order to obtain a final comment in terms of section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999), including Regulations issued thereunder, as necessary; and
- Load the relevant documents on the South African Heritage Resources Information System (SAHRIS) to obtain a comment from SAHRA.