# FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT IN SUPPORT OF AN APPLICATION FOR AMENDMENT (SPLITTING) OF THE ENVIRONMENTAL AUTHORISATION (Dated 13 August 2012)

# PROPOSED MULILO PRIESKA PHOTOVOLTAIC ENERGY PLANT ON FARM KLIPGATS PAN NEAR COPPERTON, NORTHERN CAPE (DEA Ref. No. 12/12/20/2501 & NEAS Ref. No. DEAT/EIA/0000611/2011)

## *REPORT 1: PV FACILITY*

**May 2016**

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## PROJECT DETAILS

**DEA Reference No.** : 12/12/20/2501

**Title** : Final Environmental Impact Assessment Report in support of an Application For Amendment (Splitting) of the Environmental Authorisation (Dated 13 August 2012)

Report 1 - Proposed Prieska Photovoltaic Energy Plant On Farm Klipgats Pan Near Copperton, Northern Cape

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# BACKGROUND AND PURPOSE OF THE SPLIT FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Mulilo Prieska PV (Pty) Ltd obtained Environmental Authorisation for the photovoltaic facility on the Farm Klipgats Pan near Copperton, Northern Cape (DEA Ref: 12/12/20/2501) in August 2012.

Aurecon South Africa undertook an Environmental Impact Assessment (EIA) process on behalf of Mulilo Renewable Energy (Pty) Ltd, in terms of the EIA Regulations of 2010 GN R. 543, 544 and 545 of the National Environmental Management Act (No. 107 of 1998). The Final Environmental and Social Impact Assessment Report was submitted to the National Department of Environmental Affairs (DEA), as the competent authority in May 2012, and an Authorisation was issued in August 2012. The project was awarded preferred bidder status under the Department of Energy (DoE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme in Round 3 of the programme, and is currently under construction.

The power line and substation were assessed separately from the PV facility in the original EIA report (Aurecon, May 2012), however a single EIA process was followed and a single EA received for both the facility and the grid connection. In order to meet the requirements of Eskom, a separate Environmental Authorisation is required for the grid connection infrastructure (i.e. power line and switching station) to connect the facility to the electricity grid. However, under the Self Build Agreement entered into between the applicant and Eskom, the EA and EMPr for Eskom's part of the works will be transferred to Eskom's name. Two separate authorisations are therefore required, i.e. one EA for the facility and a separate EA for the grid connection.

Splitting of the Environmental Authorisation into two separate authorisations is therefore required, as follows (Figure 1):

1) Main Authorisation for the 100MW PV Facility, including IPP substation
2) Grid Connection Authorisation for the switching station and 132kV power line associated with the PV facility

Each of these EAs should include authorisation for the relevant associated infrastructure.

It is proposed that the original EIA report be amended into 2 separate documents in support of the separate authorisations, i.e. one considering and assessing the impacts associated with the main facility and one considering and assessing the impacts associated with the grid connection respectively. The EMPr will also be amended to separately consider the PV facility and the grid connection.

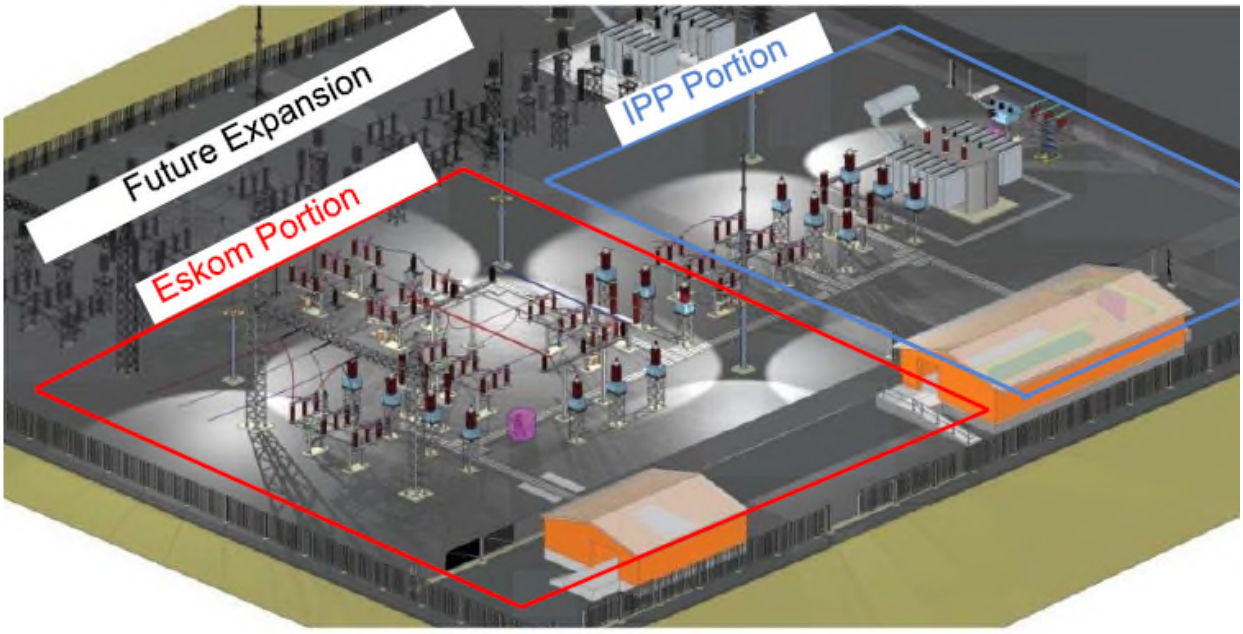


**Figure 1:** Illustration of the switching station / substation showing the IPP portion and Eskom's portion.

An amendment application in this regard has been submitted to the Department of Environmental Affairs, as the competent authority. The DEA has advised that this application is considered to be a Part 2 amendment as contemplated in terms of Regulation 31.

Savannah Environmental (Pty) Ltd has prepared a "split" Final Environmental Impact Assessment Report (FEIR) as a motivation in support of the application for amendment to the Environmental Authorisation on behalf of Mulilo Prieska PV (Pty) Ltd. This is Split Report 1 which assesses the impacts of the main PV facility only (PV panels, underground cabling, foundations, access roads, buildings / offices, substation and all associated infrastructure apart from the power line and switching station) and is effectively a "repackage" of the final EIA report submitted to DEA in April 2012 in order to provide relevant and applicable information (i.e. the relevant activities, properties, impact assessment, and mitigation for the PV facility). No new information to that provided within the final EIA report is presented in this report. The grid connection infrastructure is assessed in Report 2 which deals with the power line and substation component only.

Regulation 32 of NEMA (Act 107 of 1998) deals with the process and consideration of application for amendment as follows:

| | |
|---|---|
| (1) The holder must:<br><br>(a) within 90 days of receipt by the competent authority of the application made in terms of regulation 31, submit to the competent authority a report, reflecting—<br><br>(i) an assessment of all impacts related to the | i) No environmental impacts will result. The report is effectively a "repackage" of the final EIA report already submitted to DEA in May 2012. This report considers the main facility and provides an assessment of the impacts in this regard, as originally presented in the EIA Report for the project (Aurecon, 2012). No new information has been |

| | |
|---|---|
| proposed change;<br><br>(ii) advantages and disadvantages associated with the proposed change;<br><br>(iii) measures to ensure avoidance, management and mitigation of impacts associated with such proposed change; and<br><br>(iv) any changes to the EMPR; | provided.<br><br>ii) The need for the split is presented on page (i) of split report. There are no environmental advantages or disadvantages *per se* associated with the amendment. However, should the amendment not be granted, the applicant will not be able to meet the requirements of Eskom.<br><br>iii) No additional mitigation measures are proposed as a result of the amendment since no additional environmental impacts are associated with the proposed change. The mitigation measures presented in this split report are relevant to facility as presented in the EIA Report (Aurecon, 2012).<br><br>iv) The EMPr has been amended to only include those measures applicable to the PV facility infrastructure and is included as Appendix D. The mitigation measures presented in this split report are relevant to the main facility as presented in the EIA Report (Aurecon, 2012). No additional mitigation measures are proposed since no new impacts occur. Mitigations and recommendations relating only to the grid connection have been removed from this EMPr since they are no longer applicable. |
| which report—<br><br>(i) had been subjected to a public participation process, which had been agreed to by the competent authority, and which was appropriate to bring the proposed change to the attention of potential and registered interested and affected parties, including organs of state, which have jurisdiction in respect of any aspect of the relevant activity, and the competent authority, and<br><br>(ii) reflects the incorporation of comments received, including any comments of the competent authority; or | The split EIA report is available for a 30 day review period from **20 May - 20 June 2016** It is available for download at www.savannahsa.com or on request from Savannah Environmental. All relevant organs of state and I&APs have been notified of the availability of this report, and an advert has been placed in the Volksblad & Gemsbok newspapers and on site. Following the public review period, all comments received will be included in a comments and response report for submission to the DEA. |

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## GLOSSARY OF TERMS

| | |
|---|---|
| **Environment** | The surroundings (biophysical, social and economic) within which humans exist and that are made up of<br>i. the land, water and atmosphere of the earth;<br>ii. micro-organisms, plant and animal life;<br>iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and<br>iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing; |
| **Environmental Impact Assessment (EIA)** | A study of the environmental consequences of a proposed course of action. |
| **Environmental Impact Report Assessment (EIAR)** | A report assessing the potential significant impacts as identified during the Scoping phase. |
| **Environmental impact** | An environmental change caused by some human act. |
| **Environmental Management Programme (EMP)** | A document that provides procedures for mitigating and monitoring environmental impacts, during the construction, operation and decommissioning phases. |
| **Photovoltaic (PV)** | Method to convert solar radiation into direct current electricity[1]. |
| **Public Participation Process** | A process of involving the public in order to identify needs, address concerns, in order to contribute to more informed decision making relating to a proposed project, programme or development |
| **Scoping** | A procedure for determining the extent of and approach to an EIA, used to focus the EIA to ensure that only the significant issues and reasonable alternatives are examined in detail |
| **Scoping Report** | A report describing the issues identified |
| **Wetland** | "Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water and which in normal circumstances supports or would support vegetation typically adapted to life in saturated soils." (SA Water Act of1998). |

[1] http://en.wikipedia.org/wiki/Photovoltaics (Accessed on: 21/10/2011)

## ABBREVIATIONS

| | |
|---|---|
| **BID** | Background Information Document |
| **CRR** | Comments and Response Report |
| **DEA** | Department of Environmental Affairs (previously Department of Environmental Affairs and Tourism) |
| **DEA&DP** | Department of Environmental Affairs and Development Planning |
| **DEANC** | Department of Environmental Affairs and Nature Conservations |
| **DEAT** | Department of Environmental Affairs and Tourism |
| **DM** | District Municipality |
| **DME** | Department of Minerals and Energy |
| **DSR** | Draft Scoping Report |
| **EAP** | Environmental Assessment Practitioner |
| **EAPSA** | Environmental Assessment Practitioner of South Africa |
| **EIA** | Environmental Impact Assessment |
| **EIAR** | Environmental Impact Assessment Report |
| **EMP** | Environmental Management Programme |
| **GN** | Government Notice |
| **ha** | Hectares |
| **HIA** | Heritage Impact Assessment |
| **I&APs** | Interested and Affected Parties |
| **IEC** | International Electro-technical Commission |
| **IEIM** | Integrated Environmental Information Management |
| **IEP** | Integrated Energy Plan |
| **IPP** | Independent Power Producer |
| **IRP** | Integrated Resource Plan |
| **kV** | Kilovolt |
| **LM** | Local Municipality |
| **MW** | Megawatts |
| **NEAS** | National Environmental Authorisation System |
| **NEMA** | National Environmental Management Act (No. 107 of 1998) (as amended) |
| **NERSA** | National Energy Regulator of South Africa |
| **NHRA** | National Heritage Resources Act (No. 25 of 1999) |
| **NIRP** | National Integrated Resource Plan |
| **NWA** | National Water Act (No 36 of 1998) |
| **PPA** | Power Purchase Agreement |
| **PV** | Photovoltaic |
| **REFIT** | Renewable Energy Feed-In Tariffs |
| **SAHRA** | South African Heritage Resources Agency |
| **SACNSP** | South African Council for Natural Scientific Professions |
| **SDF** | Spatial Development Framework |
| **ToR** | Terms of Reference |
| **VIA** | Visual Impact Assessment |
| **WMA** | Water Management Area |

# 1. INTRODUCTION AND BACKGROUND

The purpose of this Chapter is to introduce the project and describe the relevant legal framework within which the project takes place. Other applicable policies and guidelines are also discussed. The Terms of Reference, scope of and approach to the Environmental Impact Assessment are described and assumptions and limitations are stated.

## 1.1 INTRODUCTION

Mulilo Prieska PV (Pty) Ltd (Mulilo) is constructing a photovoltaic (PV) solar energy plant on a farm, near Copperton in the Northern Cape. Aurecon South Africa (Pty) Ltd (Aurecon) undertook the requisite environmental process as required in terms of the National Environmental Management Act (No. 107 of 1998), as amended, on behalf of Mulilo.

This Environmental Impact Assessment (EIA) is for the 100 MW PV plant on the farm Klipgats Pan (Portion 4 of Farm No. 117) near Copperton (see **Figure 1.1**). The plant would have a footprint of 200 ha and connect to the Kronos substation by means of a new 132 kV distribution line. An alternative site to the south of the R357 was also considered.

In terms of the National Environmental Management Act (No. 107 of 1998) (as amended) (NEMA), the proposed development triggers a suite of activities, which require authorisation from the competent environmental authority before they can be undertaken. As this proposed project triggers a number of listed activities in terms of NEMA, it accordingly requires environmental authorisation. Since the project is for the generation of energy, and energy projects are dealt with by the national authority, the competent authority is the national Department of Environmental Affairs (DEA). DEA's decision will be based on the outcome of this EIA process.

The EIA Phase is the last phase in the EIA process. Accordingly, this EIA Report (EIAR)[2] aims to collate, synthesise and analyse information from a range of sources to provide sufficient information for DEA to make an informed decision on whether or not the potential environmental impacts associated with the proposed project are acceptable from an environmental perspective (the EIA process and sequence of documents produced as a result of the process are illustrated in **Figure 1.2**). Accordingly the EIAR:

- Outlines the legal and policy framework;
- Describes the Public Participation Process undertaken to date;
- Describes strategic and planning considerations;
- Describes the proposed project and its alternatives;
- Describes the assessment methodology used; and
- Assesses potential impacts and possible mitigation measures.

[2] Section 31 of EIA Regulation No. 543 of NEMA lists the content required in an EIAR.

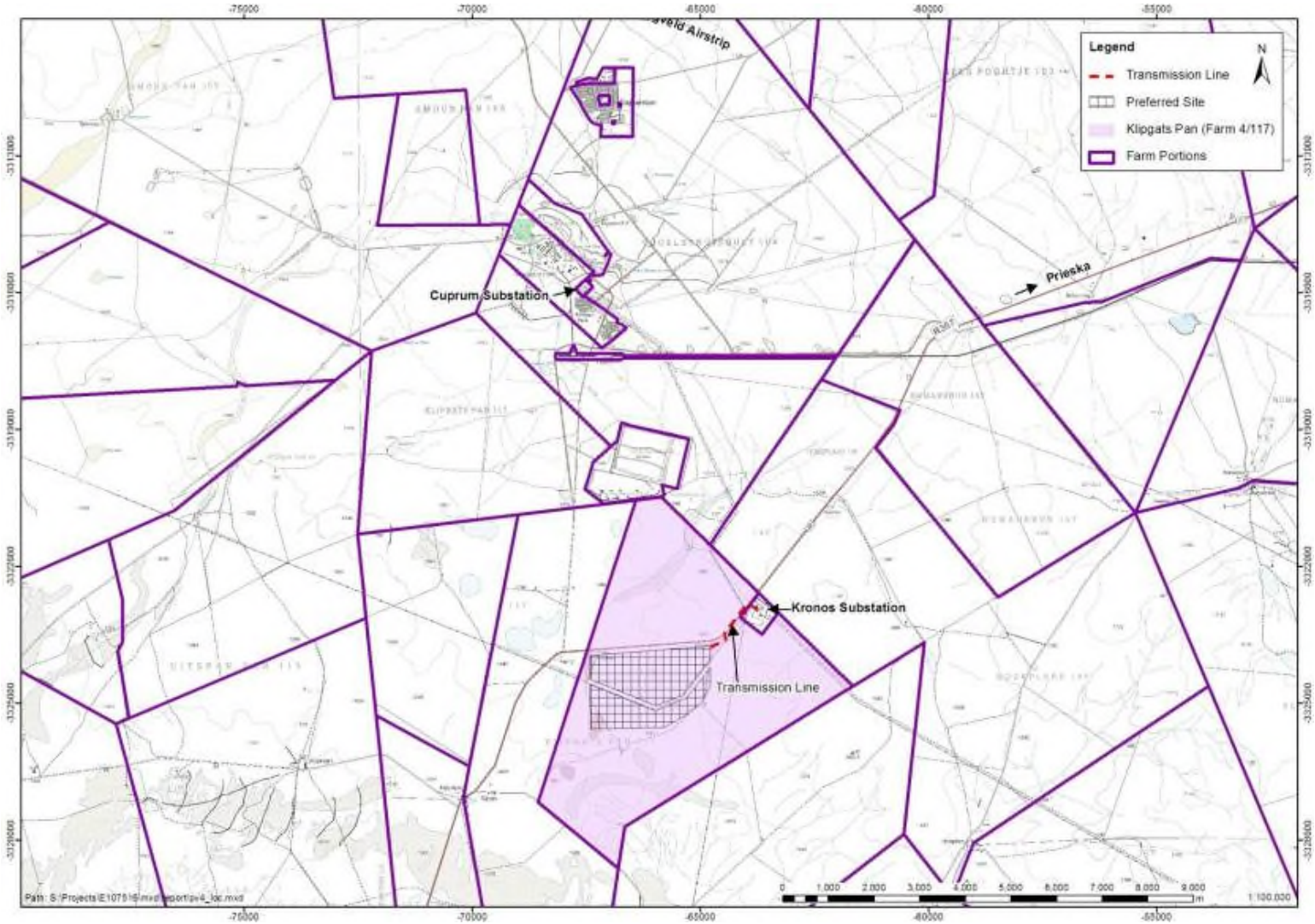



**Figure 1.1: Location of the proposed PV plant near Copperton, Northern Cape (2922 CD)**

## 1.2 LEGAL REQUIREMENTS

### *1.2.1 National Environmental Management Act, No. 107 of 1998*

NEMA, as amended, establishes the principles for decision-making on matters affecting the environment. Section 2 sets out the National Environmental Management Principles which apply to the actions of organs of state that may significantly affect the environment. Furthermore, Section 28(1) states that "every person who causes or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring". If such pollution or degradation cannot be prevented then appropriate measures must be taken to minimise or rectify such pollution or degradation.

Mulilo has the responsibility to ensure that the proposed activity as well as the EIA process conforms to the principles of NEMA. In developing the EIA process, Aurecon has been cognisant of this need, and accordingly the EA process has been undertaken in terms of NEMA and the EIA Regulations promulgated on 18 June 2010[3].

In terms of the EIA regulations, certain activities are identified, which require authorisation from the competent environmental authority, in this case DEA, before commencing. Listed activities in Government Notice (GN) No. 545 require Scoping and EIA whilst those in GN No. 544 and 546 require Basic Assessment (unless they are being assessed under an EIA process). The activities being applied for in this EIA process are listed in **Table 1.1**.

**Table 1.1: Listed activities in terms of NEMA GN No. 544, 545 and 546, 18 June 2010, to be authorised for the proposed PV plant**

| NO. | LISTED ACTIVITY |
|---|---|
| **GN No. R544, 18 June 2010** | |
| 10 | The construction of facilities or infrastructure for the transmission and distribution of electricity -<br>• outside urban areas or industrial complexes with a capacity of more than 33 , but less than 275 kilovolts; or<br>• inside urban areas or industrial complexes with a capacity of 275 kilovolts or more. |
| **GN No. R545, 18 June 2010** | |
| 1 | The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more. |
| **GN No. R546, 18 June 2010** | |
| 14 | The clearance of an area of 5 hectares or more of vegetation where 75 % or more of the vegetation cover constitutes indigenous vegetation<br>(a) in the Northern Cape<br>(i) All areas outside urban areas. |

[3] GN No. R 543, 544, 545, 546 and 547 in Government Gazette No. 33306 of 18 June 2010.

Since the proposed project is based in the Northern Cape, DEA will work closely with the provincial Department of Environmental Affairs and Nature Conservation (DEANC), to ensure that the provincial environmental concerns are specifically identified and addressed.

Further information on the EIA approach is provided in **Section 1.4**.

### *1.2.2 National Heritage Resources Act, No. 25 of 1999*

In terms of the National Heritage Resources Act (No. 25 of 1999) (NHRA), any person who intends to undertake *"any development … which will change the character of a site exceeding 5 000 $m^2$ in extent"*, *"the construction of a road…powerline, pipeline…exceeding 300 m in length"* or *"the rezoning of site larger than 10 000 $m^2$ in extent…"* must at the very earliest stages of initiating the development notify the responsible heritage resources authority, namely the South African Heritage Resources Agency (SAHRA) or the relevant provincial heritage agency. These agencies would in turn indicate whether or not a full Heritage Impact Assessment (HIA) would need to be undertaken.

Section 38(8) of the NHRA specifically excludes the need for a separate HIA where the evaluation of the impact of a development on heritage resources is required in terms of an EIA process. Accordingly, since the impact on heritage resources would be considered as part of the EIA process outlined here, no separate HIA would be required. The South African Heritage Resources Agency (SAHRA) or the relevant provincial heritage agency would review the EIA reports and provide comments to DEA, who would include these in their final environmental decision. However, should a permit be required for the damaging or removal of specific heritage resources, a separate application would have to be submitted to SAHRA or the relevant provincial heritage agency for the approval of such an activity, if Mulilo obtains authorisation and makes the decision to pursue the proposed project further.

### *1.2.3 Astronomy Geographic Advantage Act, No. 21 of 2007*

The Astronomy Geographic Advantage Act (No. 21 of 2007) provides for the preservation and protection of areas within South Africa that are uniquely suited for optical and radio astronomy; for intergovernmental co-operation and public consultation on matters concerning nationally significant astronomy advantage areas and for matters connected thereto.

Chapter 2 of the act allows for the declaration of astronomy advantage areas whilst Chapter 3 pertains to the management and control of astronomy advantage areas. Management and control of astronomy advantage areas include, amongst others, the following:

- Restrictions on use of radio frequency spectrum in astronomy advantage areas;
- Declared activities in core or central astronomy advantage area;
- Identified activities in coordinated astronomy advantage area; and
- Authorisation to undertake identified activities.

On 19 February 2010, the Minister of Science and Technology (the Minister) declared the whole of the territory of the Northern Cape province, excluding Sol Plaatje Municipality, as an astronomy advantage area for radio astronomy purposes in terms of Section 5 of the Act and on 20 August 2010 declared the Karoo Core Astronomy Advantage Area for the purposes of radio astronomy.

The area consists of three pieces of farming land of 13 407 ha in the Kareeberg and Karoo Hoogland Municipalities purchased by the National Research Foundation. The Karoo Core Astronomy Advantage Area will contain the MeerKAT radio telescope and the proposed core planned Square Kilometre Array (SKA) radio telescope that would be used for the purposes of radio astronomy and related scientific endeavours. South Africa, along with Australia, has been shortlisted to host the world's largest telescope, the SKA. South Africa's bid proposes that the core of the telescope be located in an arid area of the Northern Cape, with about three antenna stations in Namibia, four in Botswana and one each in Mozambique, Mauritius, Madagascar, Kenya and Zambia[4]. A final decision on the location is expected to be made in early 2012 by the SKA Board of Directors.

The proposed plant falls outside of the Karoo Core Astronomy Advantage Area, but inside the general astronomy advantage area.

The Minister may still declare that activities prescribed in Section 23(1) of the Act may be prohibited within the area, such as the construction, expansion or operation of any fixed radio frequency interference sources and the operation, construction or expansion of facilities for the generation, transmission or distribution of electricity. It should be noted that solar energy facilities are unlikely to cause radio frequency interference. While the Minister has not yet prohibited these activities it is important that the relevant astronomical bodies are notified of the proposed project and provided with the opportunity to comment on the proposed project.

### *1.2.4 National Water Act, No 36 of 1998*

The National Water Act (NWA) (Act No 36 of 1998) provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA.

In terms of Section 21 (c) and (i)[5] of the NWA any activity which takes place within 500 m radius of the boundary of any wetland is excluded from the General Authorisation for these

[4] http://www.ska.ac.za/bid/index.php (Accessed on: 19/10/11)

[5] (c) impeding of diverting the flow of water in a watercourse; (i) altering the bed, banks, course or characteristics of a watercourse.

water uses and as such, must be licenced. Should the proposed development occur within 500 m radius of a wetland (including ephemeral pans such as are found on site) it may be necessary to submit a water use license application to the Department of Water Affairs (DWA). If a water use licence application is required it would fall outside of the scope of this EIA and would be addressed by Mulilo as part of their broader project planning. Comment will also be sought from DWA as part of the EIA process.

### *1.2.5 Conservation of Agricultural Resources Act, No. 43 of 1983*

The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) makes provision for the conservation of the natural agricultural resources of South Africa through maintaining the production potential of land, combating and preventing erosion, preventing the weakening or destruction of the water sources, protecting vegetation, and combating weeds and invader plants. Regulation 15 of CARA lists problem plants (undesired aliens, declared weeds, and plant invaders). Plants listed in this regulation must be controlled by the landowner.

As part of the EIA process, recommendations have been made to ensure that measures are implemented to maintain the agricultural production of land, prevent soil erosion, and protect any water bodies and natural vegetation on site. Mulilo together with the relevant landowners should also ensure the control of any undesired aliens, declared weeds, and plant invaders listed in the regulation that may pose as a problem as a result of the proposed PV plant.

### *1.2.6 Other applicable legislation and policies*

This section provides an overview of the policy and legislative context in which the development of renewable energy projects takes place in South Africa. The following policies and legislative context are described:

- White Paper on the Energy Policy of the Republic of South Africa (1998);
- White Paper on Renewable Energy (2003);
- National Energy Act (2008);
- National Electricity Regulation Act (2006);
- Integrated Energy Plan for the Republic of South Africa (2003);
- Integrated Resource Plan (2011);
- National Integrated Resource Plan for Electricity (2002);
- Independent Power Producer (IPP) Procurement Process; and
- Policies regarding greenhouse gas and carbon emissions.

#### a) White Paper on the Energy Policy of the Republic of South Africa (1998)

As required by the Constitution of the Republic of South Africa (Act No. 108 of 1996), the White Paper on the Energy Policy of the Republic of South Africa (1998) was published by

the Department of Minerals and Energy in response to the changing political climate and socio-economic outlook. Key objectives are identified in terms of energy supply and demand, as well as co-ordinated with other social sectors and between energy sub-sectors.

The White Paper commits to government's focused support for the development, demonstration and implementation of renewable energy sources for both small and large-scale applications. With the aim of drawing on international best practice, specific emphasis is given to solar and wind energy sources, particularly for rural and often off-grid areas.

While considering the larger environmental implications of energy production and supply, the White Paper looks into the future to adopting an integrated resource planning approach, integrating the environmental costs into economic analysis. It is with this outlook that the renewable energy, including solar energy, is seen as a viable, attractive and sustainable option to be promoted as part of South Africa's energy policy towards energy diversification.

**b) White Paper on Renewable Energy (2003)**

Published by the Department of Minerals and Energy (DME) in 2003, the White Paper on renewable Energy supplements the above-mentioned Energy Policy which identified the medium- and long-term potential for renewable energy as significant. The White Paper sets out the vision, policy principles, strategic goals and objectives in terms of renewable energy. At the outset the policy refers to the long term target of "*10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013."* The aim of this 10-year plan is to meet this goal via the production of mainly biomass, wind, solar and small-scale hydro sources. It is estimated that this would constitute approximately 4% of projected energy demand for 2013.

The White Paper presents South Africa's options in terms of renewable energy as extensive and a viable and sustainable alternative to fossil fuel options. A strategic programme of action to develop South Africa's renewable energy resources is propose, particularly for power generation and reducing the need for coal-based power generation. The starting point will be a number of initial investments spread across both relatively low cost technologies, such as biomass-based cogeneration, as well as technologies with larger-scale application, such as solar water heating, wind and small-scale hydro.

Addressing environmental impacts and the overarching threats and commitments to climate change, the White Paper provides the platform for further policy and strategy development in terms of renewable energy in the South African energy environment.

**c) National Energy Act (No. 34 of 2008) and Electricity Regulation Act (No. 4 of 2006)**

South Africa has two acts that direct the planning and development of the country's electricity sector:

i. The National Energy Act (No. 34 of 2008); and
ii. The Electricity Regulation Act (ERA) (No. 4 of 2006).

In May 2011, the Department of Energy (DoE) gazetted the Electricity Regulations on New Generation Capacity under the ERA. The New Generation Regulations establish rules and guidelines that are applicable to the undertaking of an Independent Power Producer (IPP) Bid Programme and the procurement of an IPP for new generation capacity. They also facilitate the fair treatment and non-discrimination between IPPs and the buyer of the energy[6].

In terms of the New Generation Regulations, the Integrated Resource Plan (IRP) (see **Section 1.2.6.f**) has been developed by the DoE and sets out the new generation capacity requirement per technology, taking energy efficiency and the demand-side management projects into account. This required, new generation capacity must be met through the technologies and projects listed in the IRP and all IPP procurement programmes will be undertaken in accordance with the specified capacities and technologies listed in the IRP[7].

**d) IPP Procurement Process**

South Africa aims to procure 3 725 MW capacity of renewable energy by 2016 (the first round of procurement). This 3 725 MW is broadly in accordance with the capacity allocated to renewable energy generation in IRP2010.

On 3 August 2011, DoE formally invited interested parties with relevant experience to submit proposals for the finance, operation and maintenance of renewable energy generation facilities adopting any of onshore wind, solar thermal, solar photovoltaic, biomass, biogas, landfill gas or small hydro technologies for the purpose of entering, *inter alia*, an Implementation Agreement with DoE and a Power Purchase Agreement with a buyer (Eskom)[8] in terms of the ERA. This Request for Qualification and Proposals (RFP) for new generation capacity was issued under the IPP Procurement Programme. The IPP Procurement Programme has been designed to contribute towards the target of 3 725 MW and towards socio-economic and environmentally sustainable growth, and to start and stimulate the renewable industry in South Africa[9].

In terms of this IPP Procurement Programme, Bidders will be required to bid on tariff and the identified socio-economic development objectives of DoE. The tariff will be payable by the Buyer should the project be selected. Although earlier information was that the 2009 Renewable Energy Feed In Tariff would act as an upper limit on price, the actual caps are set out in **Table** 1.2[10]. A bid will be 'non-compliant' and automatically rejected during the

[6] http://www.eskom.co.za/c/73/ipp-processes/ (Accessed on: 29/10/11)
[7] http://www.eskom.co.za/c/73/ipp-processes/ (Accessed on: 29/10/11)
[8] http://www.ipp-renewables.co.za/wp-content/uploads/2011/08/Tender_Notice.png (Accessed on: 30/10/11)
[9] http://www.ipp-renewables.co.za/ (Accessed on: 30/10/11)
[10] http://www.nortonrose.com/knowledge/publications/54959/south-africa-renewable-energy-ipp-request-for-proposals (Accessed on: 30/10/11)

qualification phase if the price cap is exceeded. Bid Responses which are submitted must be accompanied by a Bid Guarantee in the form of a bank guarantee for an amount equal to R 100 000 per MW of the proposed installed capacity[11].

The generation capacity allocated to each technology is set out in **Table 1.2**.

**Table 1.2: Generation capacity and price cap per each technology**

| Technology | MW | Price cap (per MWh) |
|---|---|---|
| Onshore wind | 1 850 | R 1 150 |
| Concentrated solar thermal | 200 | R 2850 |
| Solar photovoltaic | 1 450 | R 2850 |
| Biomass solid | 12.5 | R 1070 |
| Biogas | 12.5 | R 800 |
| Landfill gas | 25 | R 600 |
| Small hydro | 75 | R 1 030 |
| Small projects[12] | 100 | As above |
| **TOTAL** | **3 725** | |

Each project procured in terms of this IPP Procurement Programme will be required to achieve commercial operation by not later than 2016.

The submission and selection dates for projects for the RFP are given in **Table 1.3**.

**Table 1.3: Bid submission dates, selection of preferred bidders and signing of agreements[13]**

| Submission no. | Submission date | Preferred bidder selection date | Signing of agreements date |
|---|---|---|---|
| First | 4 November 2011 | 25 November 2011 | 19 June 2012 |
| Second | 5 March 2012 | 14 May 2012 | 13 December 2012 |
| Third | 20 August 2012 | 29 October 2012 | 31 May 2013 |
| Fourth | 4 March 2013 | 14 May 2013 | 13 December 2013 |
| Fifth | 13 August 2013 | 21 October 2013 | 26 May 2014 |

The selection process to determine the preferred bidders will be based on both price and other economic development criteria in a 70 %/ 30 % ratio respectively (Creamer, T. 2011). If the maximum MW allowance for any particular technology has been allocated during any particular window, then the subsequent bidding opportunities will not be opened for that technology.

IPPs that wish to connect to Eskom's network will be required to apply for a connection, pay a connection charge and sign a connection and use-of-system agreement[14]. All IPPs will be

[11] http://www.ipp-renewables.co.za/wp-content/uploads/2011/08/Tender_Notice.png (Accessed on: 30/10/11)
[12] Small projects are less than 5 MW.
[13] http://www.ipp-renewables.co.za/?page_id=524 (Accessed on: 30/10/11)
[14] http://www.eskom.co.za/c/article/150/independent-power-prodicers-ipp/ (Accessed on: 30/10/11)

provided non-discriminatory access to Eskom's network, subject to the IPPs obtaining its required approvals such as EIA's and a generating and trading licence from NERSA.

### e) Integrated Energy Plan for the Republic of South Africa

Commissioned by DME in 2003, the Integrated Energy Plan (IEP) aims to provide a framework in which specific energy policies, development decisions and energy supply trade-offs can be made on a project-by-project basis. The framework is intended to create a balance in providing low cost electricity for social and economic developments, ensuring security of supply and minimising the associated environmental impacts.

The IEP projected that the additional demand in electricity would necessitate an increase in electricity generation capacity in South Africa by 2007. Furthermore, the IEP concluded that, based on energy resources available in South Africa, coal would be the primary fuel source in the 20 year planning horizon, which was specified as the years 2000 to 2020, although other cleaner technologies continue to be investigated as alternatives in electricity generation options. Therefore, though the next two decades of energy generation are anticipated to remain coal-based, alternative technologies and approaches are available and need to be contextually considered.

### f) Integrated Resource Plan

The Integrated Resource Plan (IRP) is a National Electricity Plan, which is a subset of the Integrated Energy Plan. The IRP is also not a short or medium-term operational plan but a plan that directs the expansion of the electricity supply over the given period.

The IRP, indicating the schedule for energy generation programmes, was first gazetted on 31 December 2009. A revised schedule was gazetted on 29 January 2010 and the schedule has once again been revised and the final IRP (IRP2010-2030) was gazetted on 6 May 2011.

Developed for the period of 2010 to 2030, the primary objective of the IRP2010, as with its predecessors, is to determine the long-term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing, and cost. While promoting increased economic development through energy security, the IRP2010 aims to achieve a "*balance between an affordable electricity price to support a globally competitive economy, a more sustainable and efficient economy, the creation of local jobs, the demand on scarce resources such as water and the need to meet nationally appropriate emission targets in line with global commitments*".

As can be seen by **Table 1.4** below the current final IRP provides for an additional 14 749 MW (shaded in grey) of renewable energy in the electricity mix in South Africa by 2030

The final IRP2010 reflects both the consultation process on the draft IRP2010 currently being undertaken with stakeholders and the further technical work undertaken in this period.

**Table 1.4: Policy adjusted scenario of the IRP2010 as gazetted on 6 May 2011**

| | Total generating capacity in 2030 | | Capacity added (including committed) from 2010-2030 | | New (uncommitted) capacity options from 2010-2030 | |
|---|---|---|---|---|---|---|
| **Technology** | **MW** | **%** | **MW** | **%** | **MW** | **%** |
| Coal | 41 074 | 45.9 | 16 383 | 29.0 | 6 250 | 14.7 |
| OCGT | 7 330 | 8.2 | 4 930 | 8.7 | 3 910 | 9.2 |
| CCGT | 2 370 | 2.6 | 2 370 | 4.2 | 2 370 | 5.6 |
| Pumped Storage | 2 912 | 3.3 | 1 332 | 2.4 | 0 | 0 |
| Nuclear | 11 400 | 12.7 | 9 600 | 17.0 | 9 600 | 22.6 |
| Hydro | 4 759 | 5.3 | 2 659 | 4.7 | 2 609 | 6.1 |
| Wind | 9 200 | 10.3 | 9 200 | 16.3 | 8 400 | 19.7 |
| CSP | 1 200 | 1.3 | 1 200 | 2.1 | 1 000 | 2.4 |
| PV | 8 400 | 9.4 | 8 400 | 14.9 | 8 400 | 19.7 |
| Other | 890 | 1.0 | 465 | 0.8 | 0 | 0 |
| **Total** | **89 532** | **100** | **56 539** | **100** | **42 539** | **100** |

It is noted that *"given the rapid changes in generation technologies and pricing, especially for "clean" energy sources, the IRP will have to be reviewed on a regular basis, for instance every two years, in order to ensure that South Africa takes advantage of emerging technologies. This may result in adjustments in the energy mix set out in the balanced revised scenario within the target for total system capacity."*

### g) National Integrated Resource Plan for Electricity

The National Integrated Resource Plan (NIRP) for Electricity is a long-term electricity capacity plan which defines the need for new generation capacity for the country. The National Energy Regulator of South Africa (NERSA) published NIRP1 in 2002, which was replaced by NIRP2 in 2005. The outcome of the NIRP2 determined that coal would remain the major fuel for generating electricity over the next 20 years and that additional energy generation facilities would be required from 2007 onwards. The NIRP is replaced by the Integrated Resource Plan (IRP), described in **Section 1.2.4.f** above.

### h) Policies regarding greenhouse gas and carbon emissions

Gases that contribute to the greenhouse effect are known to include carbon dioxide ($CO_2$), methane ($CH_4$), water vapour, nitrous oxide, chlorofluorocarbons (CFCs), halons and peroxyacylnitrate (PAN). All of these gasses are transparent to shortwave radiation reaching the earth's surface, but trap long-wave radiation trying to leave the earth's surface. This action leads to a warming of the earth's lower atmosphere, resulting in changes in the global

and regional climates, rising sea levels and extended desertification. This in turn is expected to have severe ecological consequences and a suite of implications for mankind.

Electricity generation using carbon based fuels is responsible for a large proportion of carbon dioxide ($CO_2$) emissions worldwide. In Africa, the $CO_2$ emissions are primarily the result of fossil fuel burning and industrial processes, such coal fired power stations. South Africa accounts for some 38% of Africa's $CO_2$ emissions. The global per capita $CO_2$ average emission level is 1.23 metric tonnes. In South Africa however, the average emission rate is 2.68 metric tonnes per person per annum. The International Energy Agency (2008) estimates that nearly 50% of global electricity supplies will need to come from renewable energy sources in order to halve $CO_2$ emissions by 2050 and minimise significant, irreversible climate change impacts.

The United Nations Framework Convention on Climate Change (UNFCCC) has initiated a process to develop a more specific and binding agreement on the reduction of greenhouse gas (GHG) emissions. This led to negotiations with a particular focus on the commitments of developed countries, and culminated in the adoption of the Kyoto Protocol in 1997, which came into effect in February 2005. Using the above framework to inform their approach, the Kyoto Protocol has placed specific legal obligations in the form of GHG reduction targets on developed countries and countries with 'Economies in Transition'. The developed countries listed in Annex 1 of the UNFCCC are required to reduce their overall emissions of six GHGs by at least 5 % below the 1990 levels between 2008 and 2012. While South Africa, as a developing country, is not obliged to make such reductions, the increase in greenhouse gas emissions must be viewed in light of global trends to reduce these emissions significantly. More recently under the Copenhagen Accord 2010, countries representing over 80 % of global emissions have submitted pledges on emission reductions. South Africa's commitment is to reduce GHG emissions 34 % by 2020 and 42 % by 2025.

The Kyoto Protocol, to which South Africa is a signatory, was informed by the principles of sustainable development which resulted in related policies and measures being identified to promote energy efficiency while protecting and enhancing the 'sinks and reservoirs' of greenhouse gases (forests, ocean, etc.). Other methods/approaches included encouraging more sustainable forms of agriculture, in addition to increasing the use of new and renewable energy and the adoption/implementation of advanced and innovative environmentally sound technologies. South African policies are being informed by the Kyoto Protocol (which is valid until 2012) and its partial successor the Copenhagen Accord 2010 and associated sustainable development principles whereby emphasis is being placed on industries for 'cleaner' technology and production.

## 1.3 TERMS OF REFERENCE AND SCOPE OF THE EIA

In October 2011, Mulilo appointed Aurecon to undertake an EIA process, in terms of NEMA, for the proposed PV plant near Copperton in the Northern Cape.

This EIA process specifically excludes any upgrades of existing Eskom infrastructure (i.e. the existing grid) that may be required but does include new connections to the grid.

### 1.3.1 Guidelines

This EIA process is informed by the series of national Environmental Guidelines[15] where applicable and relevant:

- Integrated Environmental Information Management (IEIM), Information Series 5: Companion to the NEMA EIA Regulations of 2010 (DEA, 2010);
- Implementation Guidelines: Sector Guidelines for the EIA Regulations (draft) (DEA, 2010);
- IEIM, Information Series 2: Scoping (Department of Environmental Affairs and Tourism (DEAT), 2002);
- DEAT. 2002. IEIM, Information Series 3: Stakeholder Engagement (DEAT, 2002);
- IEIM, Information Series 4: Specialist Studies (DEAT, 2002);
- IEIM, Information Series 11: Criteria for determining Alternatives in EIA (DEAT, 2004);
- IEIM, Information Series 12: Environmental Management Plans (DEAT, 2004);
- Integrated Environmental Management Guideline Series, Guideline 4: Public Participation, in support of the EIA Regulations. Unpublished (DEAT, 2005); and
- Integrated Environmental Management Guideline Series, Guideline 7: Detailed Guide to Implementation of the Environmental Impact Assessment Regulations. Unpublished (DEAT, 2007).

The following guidelines from the Department of Environmental Affairs and Development Planning (Western Cape) (DEA&DP) were also taken into consideration:

- DEA&DP. 2011. Guideline on Alternatives, EIA Guideline and Information Document Series. (DEA&DP, October 2011).
- DEA&DP. 2011. Guideline on Need and Desirability, EIA Guideline and Information Document Series. (DEA&DP, October 2011).
- DEA&DP. 2011. Guideline on Public Participation, EIA Guideline and Information Document Series. (DEA&DP, October 2011).

## 1.4 APPROACH TO THE PROJECT

As outlined in **Figure 1.2**, there are three distinct phases in the EIA process, as required in terms of NEMA, namely the Initial Application Phase, the Scoping Phase and the EIA Phase. This report covers the third phase, *viz.* the EIA Phase.

[15] Note that these Guidelines have not yet been subjected to the requisite public consultation process as required by Section 74 of R385 of NEMA.

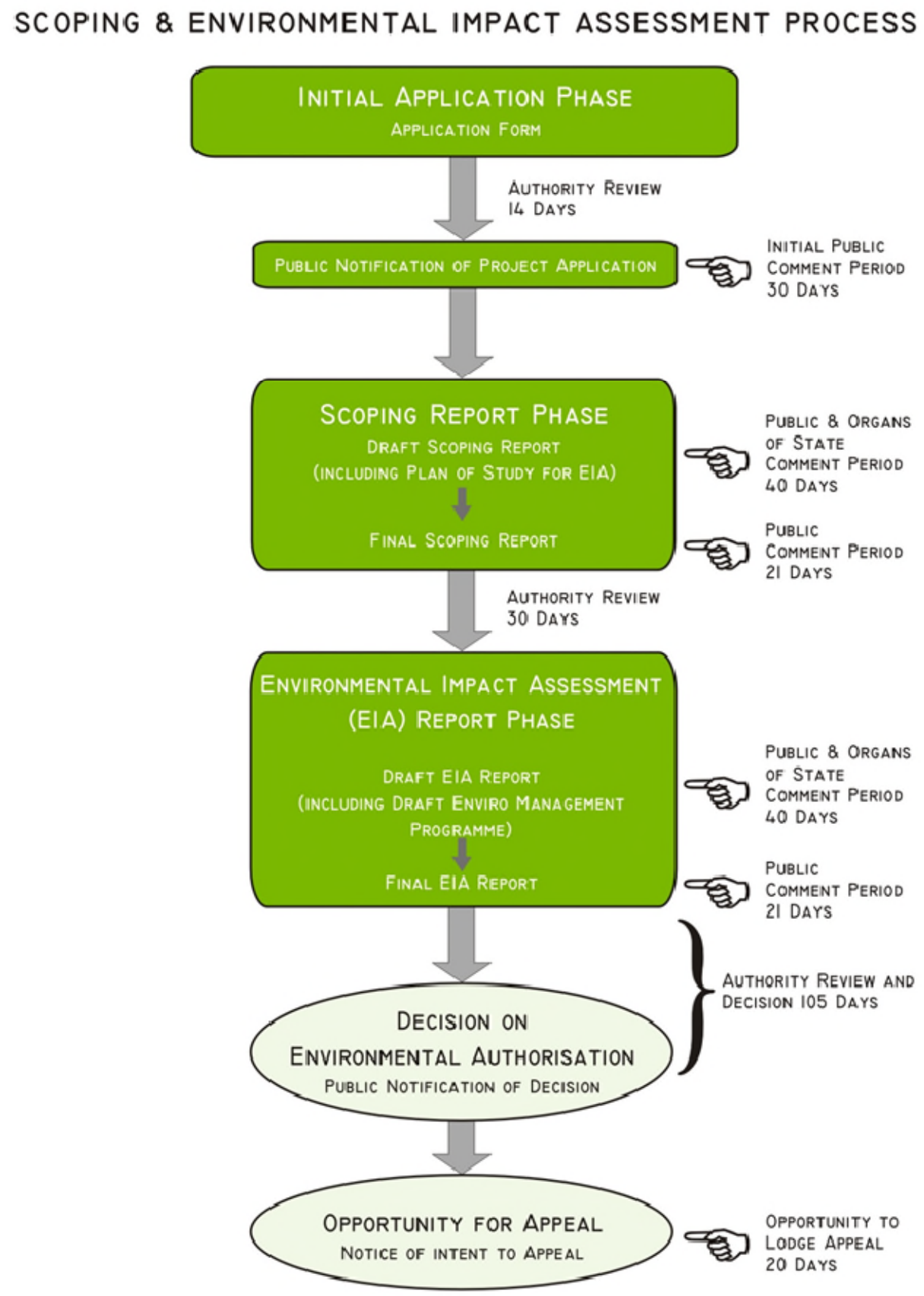



**Figure 1.2: The EIA process in terms of NEMA**

### *1.4.1 Initial Application Phase*

The Initial Application Phase entailed the submission of an EIA Application Form to notify DEA of the project, on 3 October 2011. Acknowledgement of receipts of the EIA Application Form was received from DEA on 19 October 2011. The Application Forms and DEA's letters of acknowledgement were included in the Scoping Report.

### *1.4.2 The Scoping Phase*

Scoping is defined as a procedure for determining the extent of, and approach to, the EIA Report Phase and involves the following key tasks:

- Involvement of relevant authorities and Interested and Affected Parties (I&APs);
- Identification and selection of feasible alternatives to be taken through to the EIA phase;
- Identification of significant issues/impacts associated with each alternative to be examined in the EIAR; and
- Determination of specific terms of reference for any specialist studies required in the EIAR (Plan of Study for the EIA Report).

The Scoping Phase involved a desktop review of relevant literature, including a review of previous environmental studies in the area. These included, *inter alia*, the following:

- Pixley ka Seme Integrated Environmental Management Program (IEMP)(African EPA, 2007);
- Pixley ka Seme District Municipality Spatial Development Framework (SDF) (2007);
- Siyathemba IEMP (African EPA, 2007);
- Vegetation Map of South Africa (Mucina & Rutherford, 2006);
- Proposed Solar Farm, Prieska. Draft Environmental Impact Assessment Report (EIAR) (DJ Environmental Consultants, 2010);
- Proposed Construction of a Wind Farm and Photovoltaic (PV) Plant near Prieska, Northern Cape Province of South Africa. Draft Scoping Report (SiVEST, 2011);
- Proposed Wind Energy Facility near Copperton, Northern Cape: Final Scoping Report. Report No. 5357A/ 106563 (Aurecon, 2011); and
- Proposed Wind Energy Facility near Copperton, Northern Cape: Draft Environmental Impact Report. Report No. 5748/106563 (Aurecon, 2012).

Other tasks undertaken included:

- Placement of advertisements in a local newspaper, the Gemsbok, notifying the broader public of the initiation of the EIA and inviting them to register as I&APs from 2 November 2010;
- Erection of a site notice at the entrance to Farm Klipgats Pan on 8 November 2011;
- Lodging the DSR at Prieska (Elizabeth Vermeulen) Public Library, Ietznietz Guest House in Copperton and on the Aurecon website from 8 November 2011. All registered I&APs were notified of the availability of the DSR by means of a letter sent by fax, post and/or

e-mail on 7 November 2011. The notification letters also included a copy of the Executive Summary of the DSR in English and Afrikaans;

- I&APs had 40 days, until 5 January 2012, to submit their written comments on the DSR.
- On 6 December 2011 a second notification letter was distributed to I&APs regarding the extension of the comment period from 5 January 2012 to 9 January 2012 due to a delay that occurred during the mailing of the first notification letters;
- I&APs had 40 days, until 9 January 2012, to submit their written comments on the DSR. Cognisance was taken of all comments when compiling the final report, and the comments, together with the project team and proponent's responses thereto, were included in final report;
- The Final Scoping Report (FSR) was made available to the public for review and comment until 7 February 2012 at the same locations as the DSR from 18 January 2012. Registered I&APs were informed of the FSR public comment period via a letter dated 16 January 2012 which was emailed or posted. An Executive summary together with an update page in English and/or Afrikaans was also emailed or posted to registered I&APs which highlighted the key changes made to the DSR as a result of the 40 day public comment period;
- The FSR outlined the full range of potential environmental impacts and feasible project alternatives and how these were derived. Moreover, it included a Plan of Study for EIA, which outlined the proposed approach to the current EIA Phase, including the requisite specialist investigations to be undertaken; and
- The FSR and associated Plan of Study for EIA was submitted to DEA on 16 January 2012 and accepted on 30 March 2012 (see **Annexure A** for a copy of the acceptance letter).

An inception field trip was held on 28 and 29 of September 2011 with the Aurecon EIA team and various landowners. The purpose of the field trip was to gain an understanding of the key aspects such as:

- Biophysical aspects, including:
    - Terrestrial fauna and flora especially avifauna;
    - Surface water resources;
    - Ecological sensitive area; and
    - Vegetation types on site.
- Socio-economic aspects, including:
    - Heritage issues;
    - Land use, including agricultural potential;
    - Visual aesthetics including the location of the project in terms of roads, topography and proximity to houses;
    - Location of local communities;
    - Dust;
    - Employment opportunities; and
    - Tourism.

The information gathered during the site visit was used in refining the Plan of Study for the EIA process and Terms of Reference (ToR) for the specialist studies which were undertaken during the EIA Phase.

### *1.4.3 The EIA Phase*

The Scoping Phase is followed by the EIA Phase, during which the specialist investigations are undertaken and a comprehensive EIAR documents the outcome of the impact assessments.

This report covers the third and final phase of the EIA process, namely the EIA Phase. The purpose of the EIAR is to describe and assess the range of feasible alternatives identified during the Scoping process in terms of the potential environmental impacts identified. The ultimate purpose is to provide a basis for informed decision making, firstly by the applicant with respect to the option(s) they wish to pursue, and secondly by the environmental authority regarding the environmental acceptability of the applicant's preferred option.

The approach to the EIA Phase entailed undertaking further review of relevant literature and specialist studies. The results of this have been used to describe and assess the significance of the identified potential impacts associated with the proposed project. This EIA Report synthesises the key issues arising out of the PPP to date, to provide a balanced view of the proposed activities and the implications for the environment.

### *1.4.4 The public participation process*

Consultation with the public forms an integral component of this investigation and enables I&APs (e.g. directly affected landowners, national, provincial and local authorities, environmental groups, civic associations and communities), to identify their issues and concerns, relating to the proposed activities, which they feel should be addressed in the EIA process. To create a transparent process and to ensure that I&APs are well informed about the project, as much information as is available has been included upfront to afford I&APs numerous opportunities to review and comment on the proposed project. A summary of the public participation process is provided in **Chapter 3**.

Currently there are 56 I&APs registered on the project database (see **Annexure B** for a list of current I&APs). To date comment was received from the Department of Agriculture, Forestry and Fisheries (DAFF), Eskom and the South African Civil Aviation Authority (SACAA) on the draft EIAR and has been included in **Annexure B** of the ~~Draft~~ Final EIAR.

### *1.4.5 Authority involvement*

Authority consultation represents the first stage of the public consultation process. An EIA Application Form was submitted to DEA to notify the Department of the proposed project.

DEA Acknowledged receipt of the EIA Application Form and issued a reference number for the proposed project.

As indicated earlier, DEA will fulfil the role of the competent environmental authority for this project and will make a decision in light of the information presented in the final EIAR. However, given that the project is located in the Northern Cape province, DEA will work closely with DEA&NC in the decision-making process.

Where the need arises, Focus Group meetings will be arranged with representatives from the relevant national and provincial departments and local authorities. The purpose of these meetings will be to ensure that the authorities have a thorough understanding of the need for the project and that Aurecon has a clear understanding of the authority requirements. It is anticipated that beyond providing key inputs into the EIA, this authority scoping process will ultimately expedite the process by ensuring that the final documentation satisfies the authority requirements and that the authorities are fully informed with respect to the nature and scope of the proposed solar energy facility.

There are other authorities who have a commenting role to play in the EIA process. Their comments on the EIA Report will help to inform DEA's decision making. These authorities include:

- SiyaThemba Local Municipality;
- Pixley ka Seme District Municipality;
- South African Heritage Resources Agency;
- Northern Cape Provincial Heritage;
- Northern Cape DEANC;
- Department of Energy (Northern Cape): Regional Energy Director;
- Department of Agriculture (Northern Cape);
- Department of Agriculture, Forestry and Fisheries; and
- Department of Water Affairs.

DEA accepted the FSR on 30 March 2012 (refer to **Annexure A** for a copy of the letter from DEA).

### *1.4.6 Decision making*

The Final EIAR, together with all I&AP comments on the Draft EIAR, will be submitted to DEA for their review and decision-making. DEA must, within 60 days, do one of the following:

- Accept the report;
- Notify the applicant that the report has been referred for specialist review;
- Request amendments to the report; or
- Reject the report if it does not materially comply with regulations.

If the report is accepted, DEA must within 45 days:

- Grant authorisation in respect of all or part of the activity applied for; or

- Refuse authorisation in respect of all or part of the activity.

Once DEA issues their decision on the proposed project, all registered I&APs on the project database will be notified of the outcome of the decision within 12 calendar days of the Environmental Authorisation having been issued. Should anyone (a member of public, registered I&AP or the Applicant) wish to appeal DEA's decision, a Notice of Intention to Appeal in terms of Chapter 7 of the EIA Regulations (GN No. 543) in terms of NEMA must be lodged with the Minister of Water and Environmental Affairs within 20 calendar days of the decision being issued and the substantive Appeal must be lodged within 30 days of the Notice.

## 1.5 ASSUMPTIONS AND LIMITATIONS

### *1.5.1 Assumptions*

In undertaking this investigation and compiling the EIAR the following has been assumed:

- The strategic level investigations undertaken by the Department of Energy regarding South Africa's proposed energy mix prior to the commencement of the EIA process are technologically acceptable and robust.
- The information provided by the applicant and specialists is accurate and unbiased.
- The scope of this investigation is limited to assessing the environmental impacts associated with the proposed PV plant and connection to the grid. The project does not include any infrastructure upgrades which may be required from Eskom to allow capacity in the local grid for the proposed project.

### *1.5.2 Gaps in knowledge*

This EIA Report has identified the potential environmental impacts associated with the proposed activities. However, Mulilo is undertaking further work on the proposed project and investigations in parallel with this EIA process from a technical feasibility perspective. As such the nature and significance of the impacts presented in this report could change, should new information become available, or as the project description is refined. The purpose of this section is therefore to highlight gaps in knowledge when the EIA Phase of the project was undertaken, these include:

- Lack of confirmation of services capacity from the municipality.
- Lack of exact source of water.

The planning for the proposed facility is at a feasibility level and therefore some of the specific details are not available to the EIA process. This EIA process forms a part of the suite of feasibility studies, and as these studies progress, more information will become available. This will require the various authorities, and especially DEA, to issue their comments and ultimately their environmental decision to allow for the type of refinements

that typically occur during these feasibility studies and detailed design phase of projects. Undertaking the EIA process in parallel with the feasibility study does however have a number of benefits, such as integrating environmental aspects into the layout and design and therefore ultimately encouraging a more environmentally sensitive and sustainable project.

## 1.6 INDEPENDENCE

### *1.6.1 Aurecon*

The requirement for independence of the environmental consultant is aimed at reducing the potential for bias in the environmental process. Neither Aurecon nor any of its sub-consultants are subsidiaries of Mulilo nor is Mulilo a subsidiary to Aurecon. Furthermore, all these parties do not have any interests in secondary or downstream developments that may arise out of the authorisation of the proposed project.

The Project Director, Mr Andries van der Merwe Project Manager, Miss Louise Corbett, and the Project Staff, Miss Franci Gresse, are appropriately qualified and registered with the relevant professional bodies. Mr van der Merwe is a certified Environmental Engineer registered with the Engineering Council of South Africa (PrEng). Miss Corbett is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNSP). Aurecon is bound by the codes of conduct for Environmental Assessment Practitioner of South Africa (EAPSA) and SACNSP.

### *1.6.2 Savannah Environmental*

Neither Savannah Environmental nor any of its specialist sub-consultants are subsidiaries of or are affiliated to Eskom. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consulting company providing holistic environmental management services, including environmental impact assessments and planning to ensure compliance and evaluate the risk of development; and the development and implementation of environmental management tools. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team.

## 1.7 DETAILS AND EXPERTISE OF THE EAPS WHO COMPILED THE EIAR

### *1.7.1 Aurecon*

As noted above, the Project Director, Mr Andries van der Merwe is appropriately qualified and registered with the relevant professional bodies. Mr van der Merwe is a certified

Environmental Engineer registered with the Engineering Council of South Africa (PrEng). Mr van der Merwe has a B Eng (Civil) degree with over 13 years' experience in the field of impact assessments. Miss Louise Corbett is an Environmental Practitioner with six years' experience in the field. Miss Corbett has a BSc Honours degree in Environmental and Geographical Science and is also a Professional Natural Scientist with SACNASP. Miss Franci Gresse is an Environmental Practitioner with over three years' experience in the field. Miss Gresse has a BSc Honours degree in Conservation Ecology. Aurecon and the above environmental assessment practitioners (EAPs) are bound by the codes of conduct for EAPSA and SACNASP. The CV summaries of the key Aurecon staff were included in the Plan of Study for EIA in Chapter 5 of the Scoping Report or can be requested from Aurecon, should further detail be required.

### *1.7.2 Savannah Environmental*

The Savannah Environmental team has considerable experience in environmental impact assessments and environmental management, and have been actively involved in undertaking environmental studies, for a wide variety of projects throughout South Africa, including those associated with electricity generation.

John von Mayer - the principle author of this report holds an Honours Bachelor degree in Environmental Management and 8 years of experience in the environmental field. His key focus is on environmental impact assessments, public participation and environmental management programmes for variety of environmental projects. He is currently involved in several EIAs for renewable energy projects EIAs across the country.

Jo-Anne Thomas - the principle Environmental Assessment Practitioner (EAP) for this project, is a registered Professional Natural Scientist and holds a Master of Science degree. She has 18 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy and power line projects across the country.

## 1.8 STRUCTURE OF THE EIA REPORT

**Table 1.5** presents the structure of the EIAR as well as the applicable sections that address the required information in terms of NEMA. Specifically, Section 31 of the EIA Regulations requires that the following information is provided:

**Table 1.5: NEMA requirements for EIA Reports and location in this EIAR**

| | SECTION 31 OF REGULATION 543 | CHAPTER OR SECTION |
|---|---|---|
| | **Section 31(2) of Regulation 543** | |
| (a) | Details of:<br>(i) the EAP who prepared the report; and<br>(ii) the expertise of the EAP to carry out an EIA; | **Section 1.7** (summaries of EAP CVs provided in Chapter 5 of FSR) |
| (b) | a detailed description of the proposed activity; | Chapter 2 |
| (c) | a description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is:<br>(i) a linear activity, a description of the route of the activity; or<br>(ii) an ocean-based activity, the coordinates where the activity is to be undertaken; | Chapter 2 |
| (d) | a description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity; | Chapter 2 and 4 |
| (e) | details of the public participation process conducted in terms of subregulation (1), including-<br>(i) steps undertaken in accordance with the plan of study;<br>(ii) a list of persons, organisations and organs of state that were registered as interested and affected parties;<br>(iii) a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and<br>(iv) copies of any representations and comments received from registered interested and affected parties; | Chapter 3 and **Annexure B** |
| (f) | a description of the need and desirability of the proposed activity; | Chapter 2 |
| (g) | a description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity; | Chapter 4 |
| (h) | an indication of the methodology used in determining the significance of potential environmental impacts; | **Annexure E** |
| (i) | a description and comparative assessment of all alternatives identified during the environmental impact assessment process; | Chapter 6 |
| (j) | a summary of the findings and recommendations of any specialist report or report on a specialised process; | Chapter 4 |
| (k) | a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures; | Chapter 4 |
| (l) | an assessment of each identified potentially significant impact, including-<br>(i) cumulative impacts;<br>(ii) the nature of the impact;<br>(iii) the extent and duration of the impact;<br>(iv) the probability of the impact occurring; | Chapter 4 |

| | SECTION 31 OF REGULATION 543 | CHAPTER OR SECTION |
|---|---|---|
| | (v) the degree to which the impact can be reversed;<br>(vi) the degree to which the impact may cause irreplaceable loss of resources; and<br>(vii) the degree to which the impact can be mitigated; | |
| (m) | a description of any assumptions, uncertainties and gaps in knowledge; | **Section 1.5** |
| (n) | a reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation; | Chapter 5, **Section 5.5.2** |
| (o) | an environmental impact statement which contains-<br>(i) a summary of the key findings of the environmental impact assessment; and<br>(ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives; | Chapter 4 |
| (p) | a draft environmental management programme containing the aspects contemplated in regulation 33; | **Annexure D** |
| (q) | copies of any specialist reports and reports on specialized processes complying with regulation 32; | **Annexure C** |
| (r) | any specific information that may be required by the competent authority; and | **Annexure F** |
| (s) | any other matters required in terms of sections 24(4)(a) and (b) of the Act. | |
| | **Section 31(3) of Regulation 543** | |
| | The EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by Section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in subregulation 31(2)(g), exist. | Chapter 4 |

# 2 THE PROPOSED ACTIVITY

This chapter considers the need for the proposed project, describes the components of the proposed project that could have an impact on the environment, then summarises the suite of alternatives that were proposed for further consideration in the Scoping Report.

## 2.1 THE NEED FOR THE PROPOSED ACTIVITY

The 2011 DEA&DP Guideline for Need and Desirability[16] highlights the obligation for all proposed activities which trigger the environmental regulations to be considered in light of (amongst others) the National Framework for Sustainable Development[17], the spatial planning context, broader societal needs and financial viability. This information allows the authorities to contemplate the strategic context of a decision on the proposed activity. This section seeks to provide the context within which the need and desirability of the proposed activity should be considered.

The need for renewable energy is well documented and reasons for the desirability of solar energy include:

- Utilise resources available to South Africa;
- Meeting nationally appropriate emission targets in line with global climate change commitments;
- Enhancing energy security by diversifying generation; and
- Creating a more sustainable economy.

### *2.1.1 Utilise resources available to South Africa*

As illustrated in **Figure 2.1** South Africa is subject to some of the highest levels of solar radiation in the world with an average daily solar radiation that varies between 4.5 and 6.5 kWh/m$^2$. This in comparison to the ± 3.6 kWh/m$^2$ received by parts of the United States and ± 2.5 kWh/m$^2$ for Europe and the United Kingdom (DME, 2003), indicates that South Africa has considerable solar resource potential which should be utilised. South Africa generates most of its required electricity from coal of which there is a ready supply of at the local level. However, national government is on the verge of augmenting the existing generation capacity of thermal and nuclear power plants with renewable energy power generation, thereby creating a framework that will lead to an increase in the supply of clean energy for the nation.

[16]DEA&DP (2011) Guideline on Need and Desirability, NEMA EIA Regulations Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning (DEA&DP), October 2011.

[17]Republic of South Africa (2008) People – Planet – Prosperity: A National Framework for Sustainable Development in South Africa**.** Pretoria: Department of Environmental Affairs (DEA), Republic of South Africa [Internet]. Available from: http://www.environment.gov.za [Accessed on: 29/03/2011].

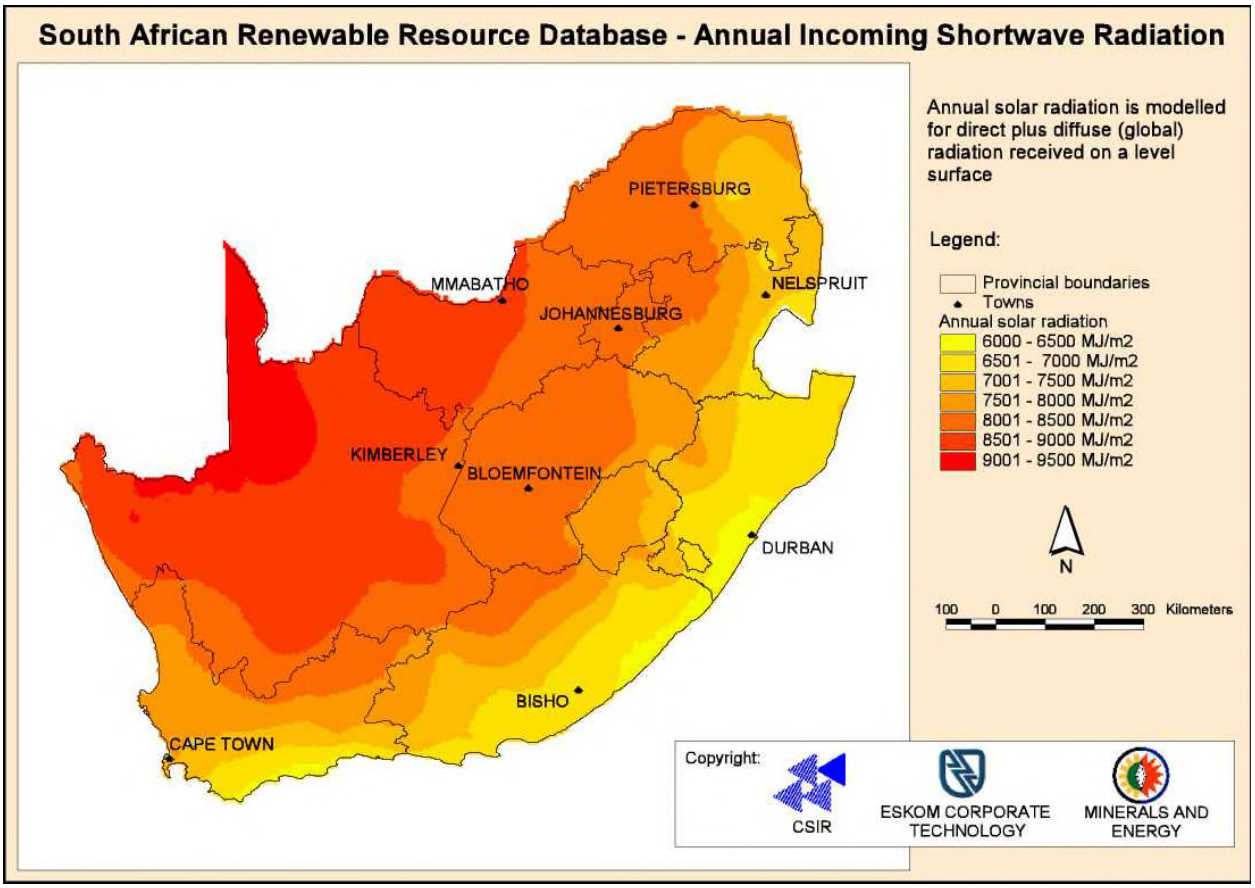



**Figure 2.1: Annual solar radiation for South Africa (DME, 2003)**

### 2.1.2 Meeting nationally appropriate emission targets in line with global climate change commitments

The proposed PV plant is considered to be of national importance in anticipation of its contribution to electricity supply and reduced reliance on fossil energy sources. The final IRP2 allows for an additional 14 749 MW of renewable energy in the electricity blend in South Africa by 2030. While there are a number of renewable energy options (including, *inter alia,* wind, solar, and hydropower) being pursued in South Africa, many more renewable energy projects are required to meet the targets set by the draft IRP2. Consequently, based on this requirement for renewable energy, Mulilo has identified various projects for PV solar energy generation.

Targets for the promotion of renewable energy now exist in more than 58 countries, of which 13 are developing countries. The South African Government has recognised the country's high level of renewable energy potential and presently has in place targets of 10 000 GWh of renewable energy by 2013 (to be produced mainly from biomass, wind, solar and small-scale hydro). This amounts to approximately 4 % (1 667 MW) of the total estimated electricity demand (41 539 MW) by 2013.

Due to concerns such as climate change, and the on-going exploitation of non-renewable, resources, there is increasing international pressure on countries to increase their share of

renewable energy generation. The proposed Klipgats Pan PV project is expected to contribute positively towards climate change mitigation.
Solar energy is a source of "green" electricity as for every 1 MWh of "green" electricity used instead of traditional coal powered stations, one can:

- Save 1 290 liters of water;
- Avoid 8.22 kg of Sulphur Dioxide ($SO_2$) emissions;
- Avoid 1000 kg of Carbon Dioxide ($CO_2$) emissions including transmission losses;
- Avoid 142 kg of ash production; and
- Contribute to social upliftment.

### *2.1.3 Enhancing energy security by diversifying generation*

The establishment of the proposed Klipgats Pan PV plant will strengthen the existing electricity grid for the area. Moreover, the project will contribute towards meeting the national energy target as set by the Department of Energy (DoE), of a 30 % share of all new power generation being derived from independent power producers (IPPs). Renewable energy is recognized internationally as a major contributor in protecting the climate, nature and the environment, as well as providing a wide range of environmental, economic and social benefits that can contribute towards long-term global sustainability. Should the proposed PV plant identified by Mulilo be acceptable, it is considered viable that long term benefits for the community and society in the Copperton / Prieska area will be realized as highlighted above. The proposed project will also have international significance as it contributes to South Africa being able to meet some of its international obligations by aligning domestic policy with internationally agreed strategies and standards as set by the United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol, and United Nations Convention on Biological Diversity (UNCBD) all of which South Africa is a signatory to.

### *2.1.4 Creating a more sustainable economy*

The Northern Cape, and particularly the Copperton area, has large tracts of land which are very dry and the farmers do their best to earn a living from the land. The towns are generally small and operate on a survival socio-economic level. The need to improve the quality of life for all, and especially for the poor, is critical in South Africa. It is expected that the proposed project will contribute directly to the upliftment of the individuals and the societies in which they live.

Skills development and the transfer thereof will be one of the top priorities and local community involvement will be enhanced as far as possible. Up to 900 job opportunities could be created during the construction (installation) phase depending on the procurement method and the primary contractor.

Additional potential benefits include:

- Reducing the demand on scarce resources, such as water;

- Local economic development; and
- Local skills development.

**Table 2.1: Specific questions as detailed in the Need and Desirability Guideline**

| NEED (TIMING)<br>Question | Response |
|---|---|
| 1. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP? | *The area proposed is currently zoned as Agricultural land. However the farmer has signed a lease agreement with Mulilo for the site. The portion leased has relatively low agricultural potential. Furthermore the additional income will safeguard the economic sustainability of the farm.*<br><br>*Even though the IDP does not specifically allow for renewable energy projects, solar energy was identified as one of the local municipality's (LM) strong points which should be developed. Other needs that were identified include sustainable developments (economically, socially and environmentally) and job creation.*<br><br>*The proposed PV plant would create job opportunities for a wide skill level. In addition, Mulilo has committed to developing a training strategy to train and employ people from the local community.* |
| 2. Should development, or if applicable, expansion of the town/ area concerned in terms if this land use (associated with the activity being applied for) occur at this point in time? | *Yes. The activity is in line with the Pixley ka Seme District Spatial Development Framework which recognises the need for sustainable land management, job creation and the development of new skills.* |
| 3. Does the community/ area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g. development is a national priority but within specific local context it could be inappropriate). | *Yes. The proposed PV plant would not only be a source of income the landowner, but it would create job opportunities for the local community as the construction and operation of the PV plant require a wide range of skill levels.*<br><br>*Secondary economic impacts may include an increase demand on the service industry through the demand for accommodation and other services.* |
| 4. Are there necessary services with appropriate | *It is anticipated that water requirements* |

| NEED (TIMING)<br>Question | Response |
|---|---|
| capacity currently available (at the time of application), or must additional capacity be created to cater for the development? | *during the construction and operational phases would be met via the Alkantpan pipeline. However, the applicant still needs to confirm whether sufficient capacity is available.*<br>*Estimated water requirements:*<br>• *Construction Phase: A 100 MW would require roughly 36 000 kℓ over a period of 6 months to a year.*<br>• *Operational Phase: 1 kℓ of water per day is required for 10 MW, therefore 100 MW would require 10 kℓ per day.*<br><br>*The establishment of the proposed Klipgats Pan PV plant would strengthen the existing electricity grid for the area resulting in a positive impact on the available electrical services.* |
| 5. Is this development provided for in the infrastructure planning of the municipality, and if not, what will the implication be on the infrastructure planning of the municipality (priority and placements of services and opportunity costs)? | *No. It should be noted that once the proposed PV plant is operational, there would be a very limited requirement for municipal services.* |
| 6. Is this project part of a national programme to address an issue of national concern or importance? | *Yes. The establishment of the proposed Klipgats Pan plant would strengthen the existing electricity grid for the area. Moreover, the project would contribute towards meeting the national energy target as set by the DoE, of a 30 % share of all new power generation being derived IPPs.* |
| **DESIRABILITY (PLACING)<br>Question** | **Response** |
| 1. Is the development the best practicable environmental option (BPEO) for this land/ site? | *Copperton is a very arid region and farmers are struggling to make a living from the land. The area being proposed for the PV plant has moderate to low agricultural potential (grazing) and the income generated by the landowners from the proposed PV plant would greatly assist in future agricultural developments and the viability of the property.* |

| NEED (TIMING)<br>Question | Response |
|---|---|
| 2. Would the approval of this application compromise the integrity of the existing approved and credible Municipal IDP and SDF as agreed to by the relevant authorities. | *No. The activity is in line with the Siyathemba IEMP and Pixley ka Seme District SDF which recognizes the need for:*<br>• *Sustainable developments;*<br>• *New skills development; and*<br>• *Economic development.*<br><br>*The proposed PV plant would not only be a source of income to farmers, but it would also create job opportunities for the local community as the construction and operation of the PV plant would require a wide range of skill levels.* |
| 3. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified from in terms of sustainability considerations? | *No. According to the Siyathemba IEMP land degradation, especially from overgrazing, is one of the key issues that need attention. The proposed development would provide additional income to the landowner which could be used for sustainable agricultural development practices on his farm.* |
| 4. Do location factors favour this land use (associated with the activity applied for) at this place? | *Yes. The sites were selected based on the following criteria:*<br>• *Solar resource potential based on historic satellite data;*<br>• *Grid connectivity and close proximity to strong grid access;*<br>• *Flat, level, and open land; and*<br>• *Unpopulated and non-arable or low arable potential land.*<br><br>*Desktop studies furthermore assessed potential sensitivities of fauna, flora, heritage, visual and other technical aspects.*<br><br>*The area proposed has low agricultural significance and is in close proximity to Eskom's existing transmission lines.* |
| 5. How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/ natural environment)? | *Potential impacts associated with the proposed PV plant are discussed in Chapter 4 of the EIAR.* |
| 6. How will the development impact on people's | *Potential impacts associated with the* |

| NEED (TIMING)<br>Question | Response |
|---|---|
| health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)? | *proposed PV plant are discussed in Chapter 4 of the EIAR.* |
| 7. Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs? | *The socio-economic impacts are assessed and discussed in Chapter 4 of the EIAR.* |
| 8. Will the proposed land use result in unacceptable cumulative impacts? | *Potential cumulative impacts associated with the proposed PV plant are discussed in Chapter 4 of the EIAR.* |

## 2.2 DESCRIPTION OF THE PROPOSED ACTIVITY

### *2.2.1 Description of site*

Mulilo proposes to construct a PV plant to generate approximately 100 MW on the farm Klipgats Pan (Portion 4 of Farm No. 117) near Copperton in the Northern Cape. This portion is privately owned by Mrs J.J. Bernard, who has entered into a long term agreement with Mulilo for the proposed project. Currently the property is leased by Mr Eckhardt. The corner point co-ordinates, moving in a clockwise manner, starting at the top left corner, are given in **Table 2.2**.

**Table 2.2**: **Co-ordinates of corner points of the site**

| Latitude | Longitude |
|---|---|
| 30° 0'8.92"S | 22°18'42.86"E |
| 30° 0'7.03"S | 22°19'1.66"E |
| 30° 1'16.91"S | 22°20'22.50"E |
| 30° 1'31.31"S | 22°20'7.22"E |
| 30° 1'44.64"S | 22°20'23.91"E |
| 30° 1'29.28"S | 22°20'38.38"E |
| 30° 2'20.16"S | 22°21'38.25"E |
| 30° 4'0.48"S | 22°18'30.89"E |
| 30° 4'30.00"S | 22°18'26.21"E |
| 30° 3'41.89"S | 22°17'21.88"E |

Klipgats Pan lies approximately 9 km to the south of Copperton and borders to the Kronos substation. The farm is approximately 2 620 ha in size and split into two portions by the R357. The proposed PV plant would cover an area of approximately 200 ha, which is currently used for cattle and sheep grazing. An alternative site for a 100 MW PV plant with a 300 ha footprint is also being considered. Both sites are located south of the R357. The locations of the proposed sites are indicated in **Figure 2.6**.

In terms of associated infrastructures, the following would be required:

- Upgrade of existing internal farm roads and construction of new roads to accommodate the construction vehicles and access the site.
- Electrical fence to prevent illegal trespassing, as well as keeping livestock from roaming between the solar arrays and causing accidental damage.
- Other infrastructure includes an office, connection centre and a guard cabin.

Please note that Mulilo has obtained verbal confirmation on grid connectivity and capacity from Eskom. Indicative quotes have been applied for from Eskom regarding grid connectivity and capacity. Furthermore, the exact connection routes (including pylon positions) to the transmission network are exceedingly difficult to determine as this is done by Eskom. Pylon positions can therefore only be estimated at this stage. These pylons would be spaced between 240 m to 360 m apart depending on site conditions.

**Figure 2.2: Example of an existing 132 kV transmission line onsite (taken 29/09/2011)**

The proposed PV plant would convert shortwave radiation (sunlight) directly into electricity via cells through a process known as the Photovoltaic Effect. The PV cells are made of silicone which acts as a semi-conductor. The cells absorb light energy which energises the electrons to produce electricity. Individual solar cells can be connected and packed into standard modules behind a glass sheet to protect the cells from the environment while obtaining desired currents and voltages. These modules are grouped together to form a panel and can last up to 50 years due to the immobility of parts, as well as the sturdiness of the structure. However, the Power Purchase Agreement (PPA) is only valid for a period of 20 years after which the plant would most likely be decommissioned and the site rehabilitated.

Grid-connected PV Power Systems (PVPS) are made up of a variety of components, which aside from the PV modules, include conductors, fuses, disconnect controls, trackers, and power conditioning units (i.e. inverters). The PVPS requires transmission infrastructure to

feed electricity into the grid, unlike the Stand-alone PV Power System that requires batteries to store electricity for use later[18]. The electricity is generated from solar energy which is transformed by the PV modules (arranged in arrays).

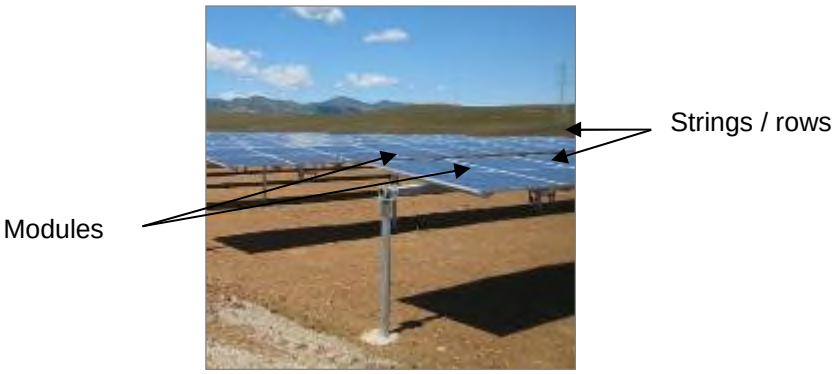



**Figure 2.3: Typical layout of panel structures**

The maximum power point tracker (MPPT) ensures that power coming from the PVs are maximised by determining the current that the inverter should draw from the PV panel[19]. The inverter converts the direct current (DC) to an alternating current (AC) to allow the electricity to be fed into the grid. **Figure 2.4** below illustrates the components of the process of generating electricity from solar energy (sun) and fed into the grid.

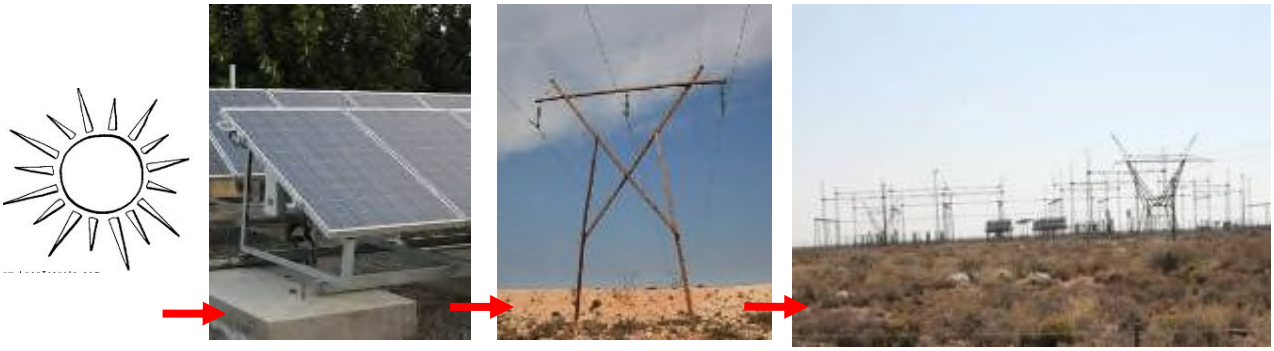



**Figure 2.4: Basic PV system layout**

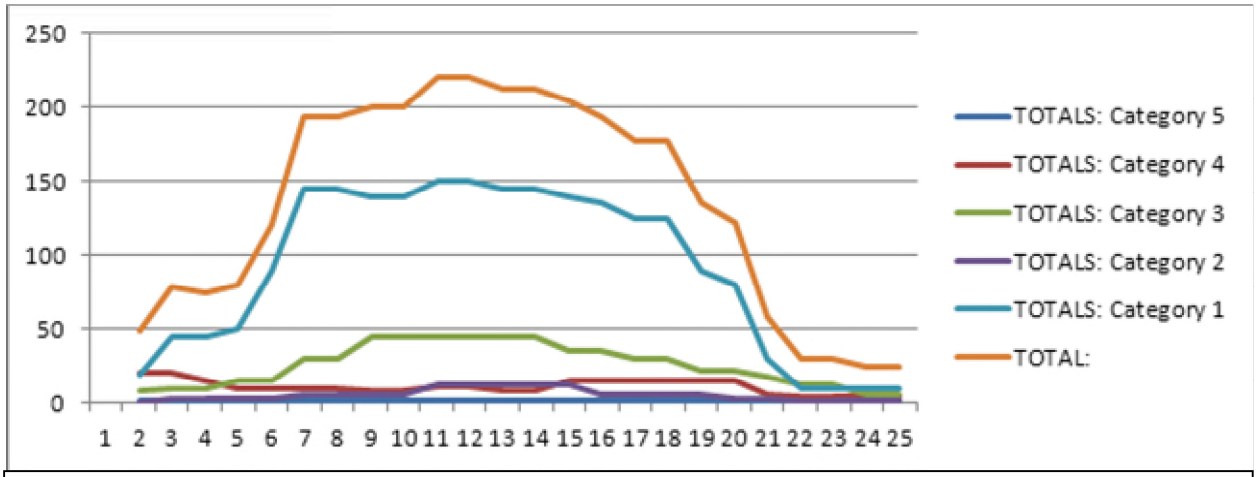
### *2.2.2 Construction phase*

The proposed facility will be constructed over a period of 18 to 30 months. Should all three proposed PV facilities (PV2 {100-300 MW PV facility proposed for the Struisbult farm}, PV3 {100-150 MW PV facility proposed for the Hoekplaas farm}, and PV4 {100 MW PV facility proposed for Klipgats pan farm}) be approved, it is anticipated they would all be constructed simultaneously, in order to make the project more cost effective and reduce the potential

[18] Source: http://en.wikipedia.org/wiki/Stand-alone_photovoltaic_power_system (Accessed on: 28/10/2011)
[19] Source: http://en.wikipedia.org/wiki/Maximum_power_point_tracker (Accessed on: 28/10/2011)

impacts associated with the construction phase. Additional labour will be sourced from the surrounding areas should capacity requirements not be met.

During the construction phase a maximum of 200 individuals (amounting to a total of 900 person months employment created over the construction period) would be employed, depending on the procurement method used as well as the primary contractor. If non-locals are employed they would be housed in temporary dwellings on site or in accommodation within Copperton and Prieska. An estimate of the anticipated workforce flow of the 24 month construction period is provided in **Figure 2.5**.




Categories: 1) Civil works operator and labourer 2) Junior staff 3) Articans, foremen, technicians 4) Engineers, Quantity Surveyors 5) Senior Management

**Figure 2.5: Estimated workforce flow for the 24 month construction period (Courtesy: Mulilo)**

| **Categories** | **Level** |
|---|---|
| Senior management | **5** |
| Engineers, Quantity Surveyors | **4** |
| Artisans, Foremen, Technicians | **3** |
| Junior staff | **2** |
| Civil works operator and labourer | **1** |

It is estimated that between 65 and 75% (130 – 150 category 1 and 2 workers) would be sourced locally and provided with the necessary training. This workforce would already have accommodation in the area and would be transported by bus to and from the site on a daily basis. The remaining 24 – 25% (50 – 70 high level staff {category 3, 4, and 5}) would be housed within the locally available accommodation in the towns and surrounding farm areas (hotels, guest houses, etc.). Onsite accommodation for 10 and 30 staff may be required for the duration of the construction period. The footprint of the onsite accommodation would be approximately 1 – 1.5 ha in extent and would be located within the temporary laydown area.

Between two and five digger loaders/ bulldozers would be required for land clearing and five to ten trucks with cranes would be required for the assembly of the facility. Approximately

450 truck deliveries conveying approximately 900 40-foot container loads would be required to construct the PV solar facility. These deliveries would be distributed over the 18 to 30 month construction period.

The construction period laydown footprint will be approximately 200 m x 100 m and the permanent laydown area will be approximately 100 m x 50 m. The need for cut and fill areas and or borrow pits at the PV sites, along roads and at sub-station/ transformer sites will only be known after the final design has been completed.

During the construction phase less than 5m³ of hazardous substances would be stored on site.

Mulilo would investigate options to obtain components either from local or international suppliers. Mulilo have indicated that preference would be given to local suppliers.

### *2.2.3 Operational phase*

The project is expected to last the full period of the PPA which is approximately 20 years. Regular cleaning of the panels to remove dust, dirt, pollen, and bird excretions would be required to ensure that the maximum quantity of sunrays can be captured by the PV panels (Ibrahim, 2010). The frequency of panel cleaning would depend on the site conditions. Panels would be washed with water and a mild, bio-degradable organic, and non-abrasive detergent.

### *2.2.4 Decommissioning phase*

The PV site would be decommissioned at the end of the PPA (20 years from the date of commissioning). The decommissioning is expected to take between six to 12 months. The module components would be removed and recycled as the silicon and aluminum can be re-used in the production of new modules. The decommissioning would be undertaken in a manner similar to that included in **Annexure G** (an extract from Gestamp Solar, 2012).

## 2.3 CONSIDERATION OF ALTERNATIVES

### *2.3.1 Introduction*

NEMA requires that alternatives are considered during the EIA process. An important function of the Scoping Phase is to screen alternatives to derive a list of feasible alternatives that need to be assessed in further detail in the EIA Phase. An alternative can be defined as a possible course of action, in place of another, that would meet the same purpose and need (DEAT, 2004).

***"alternatives"***, in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to -

a) the property on which or **location** where it is proposed to undertake the activity;
b) the type of **activity** to be undertaken;
c) the design or **layout** of the activity;
d) the **technology** to be used in the activity;
e) the **operational** aspects of the activity; and
f) the option of not implementing the activity.

The alternatives most pertinent to the proposed project include the following:

- Location alternatives - alternative locations for the entire project proposal or for components of the project proposal;
- Activity (type) alternatives - also referred to as project alternatives. Requires a change in the nature of the proposed activity. This category of alternatives is most appropriate at a strategic decision-making level;
- Layout alternatives - site layout alternatives permit consideration of different spatial configurations of an activity on a particular site; and
- Technology alternatives - technology alternatives permit consideration of different types of technology used in the project.

The above categories of alternatives are the ones most pertinent to this EIA process, and will be explored in detail below. The purpose of this section of the report is to describe all potential alternatives that are assessed in the EIA Phase of the project for further assessment.

### *2.3.2 Location alternatives*

Mulilo has considered the option to develop large scale PV power generation in South Africa over the last three years, given the good solar resource which is available over a large portion of the western part of the country. Aspects that were taken into consideration included, but were not limited to, irradiation levels, distance to the grid, site accessibility, founding conditions, topography, fire risk and current land use. Three potential sites[20] were identified by Mulilo for PV plants in the near vicinity of Copperton, including the proposed project discussed in this document (PV4). The two additional sites are of 100 MW each and located on the farms Struisbult (Farm 104/1) (PV2) and Hoekplaas (Farm 146/RE) (PV3) respectively. Mulilo further had received an Environmental Authorisation for a 20 MW PV plant (PV1) located on the Struisbult farm (Farm 104/1). The locations of these sites, as well as the approved site are given in **Figure 2.6**.

[20] Please refer to *Proposed Photovoltaic Energy Plant on the Farm Hoekplaas near Copperton in the Northern Cape (DEA Ref. No: 12/12/20/25031 / NEAS Ref. No: DEAT/EIA/0000605/2011)* and *Proposed Photovoltaic Energy Plant on Struisbult Farm near Copperton, Northern Cape* (*DEA Ref. No: 12/12/20/2502 / NEAS Ref. No: DEAT/EIA/0000605/2011),* which is available on the Aurecon website (www.aurecongroup.com – indicate "Current Location" as "South Africa" and follow the Public Participation link) for comment.

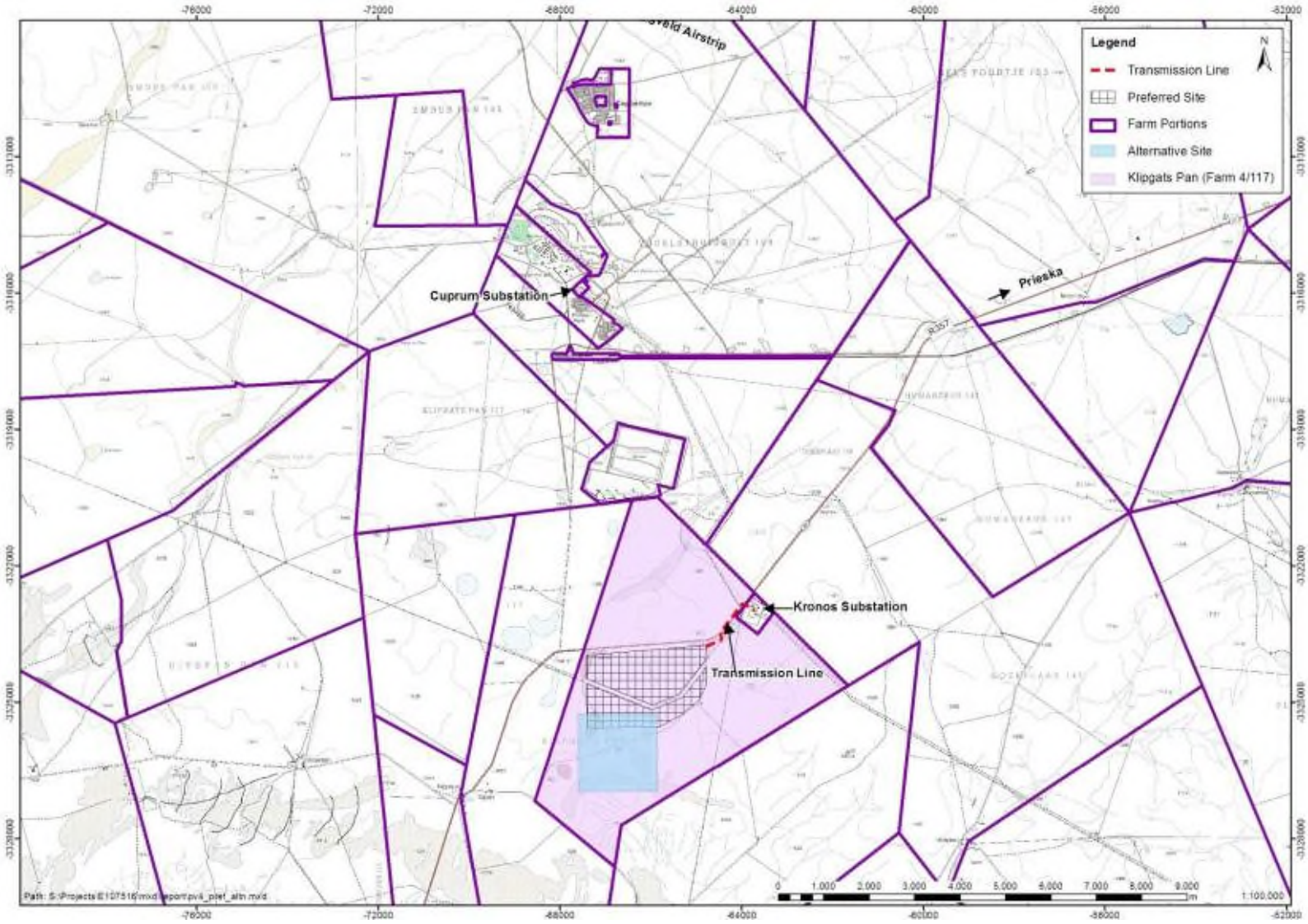



**Figure 2.6 Map showing the preferred and alternative locations for the proposed PV plant**

The proposed sites were selected based on the following criteria:

- Solar radiation based on historic satellite data;
- Grid connectivity and close proximity to strong grid access points;
- Availability of flat, level and open land;
- Land use in terms of population numbers and non-arable / low potential agricultural land; and
- Potential sensitive receptors and features, such as fauna, flora, heritage, visual and other technical aspects such as the Square Kilometre Array (SKA).

### *2.3.3 Activity alternatives*

As can be seen by the numerous policies and legislation described in **Section 1.2.4** the need for additional energy generation in South Africa is well documented. Furthermore, these policies and legislation also indicate the mixture of renewable and non-renewable energy which South Africa wishes to pursue. These strategic documents provide the road map for the activity alternatives available to South Africa. The IRP2010 allows for an additional 14 749 MW of renewable energy in the electricity mix in South Africa by 2030 and based on this requirement for renewable energy Mulilo has identified a number of projects for solar energy generation.

A project for wind power, currently at the EIA Phase[21] (see **Figure 2.7**) is located approximately 9 km to the northeast of the proposed Klipgats Pan PV plant. This indicates that the proposed site could also be suitable for wind power. However, the selection of the site was based on the requirements for solar energy. As such the only activity alternative, other than the no-go alternative, which will be investigated in this project specific EIA is solar energy.

The no-go alternative is the baseline against which all alternatives are assessed. It consists of the *status quo*, and as such will not be explicitly assessed.

### *2.3.4 Site layout alternatives*

Based on information obtained from specialist studies undertaken for the EIA phase of this project, the site location was moved to an area that is less sensitive to the proposed development and this forms the current preferred site (see **Figure 2.6**).

[21] Proposed Wind Energy Facility near Copperton, Northern Cape (DEA Ref. No. 12/12/20/2099). This document is available for comment on the Aurecon website (www.aurecongroup.com – indicate "Current Location" as "South Africa" and follow the Public Participation link).

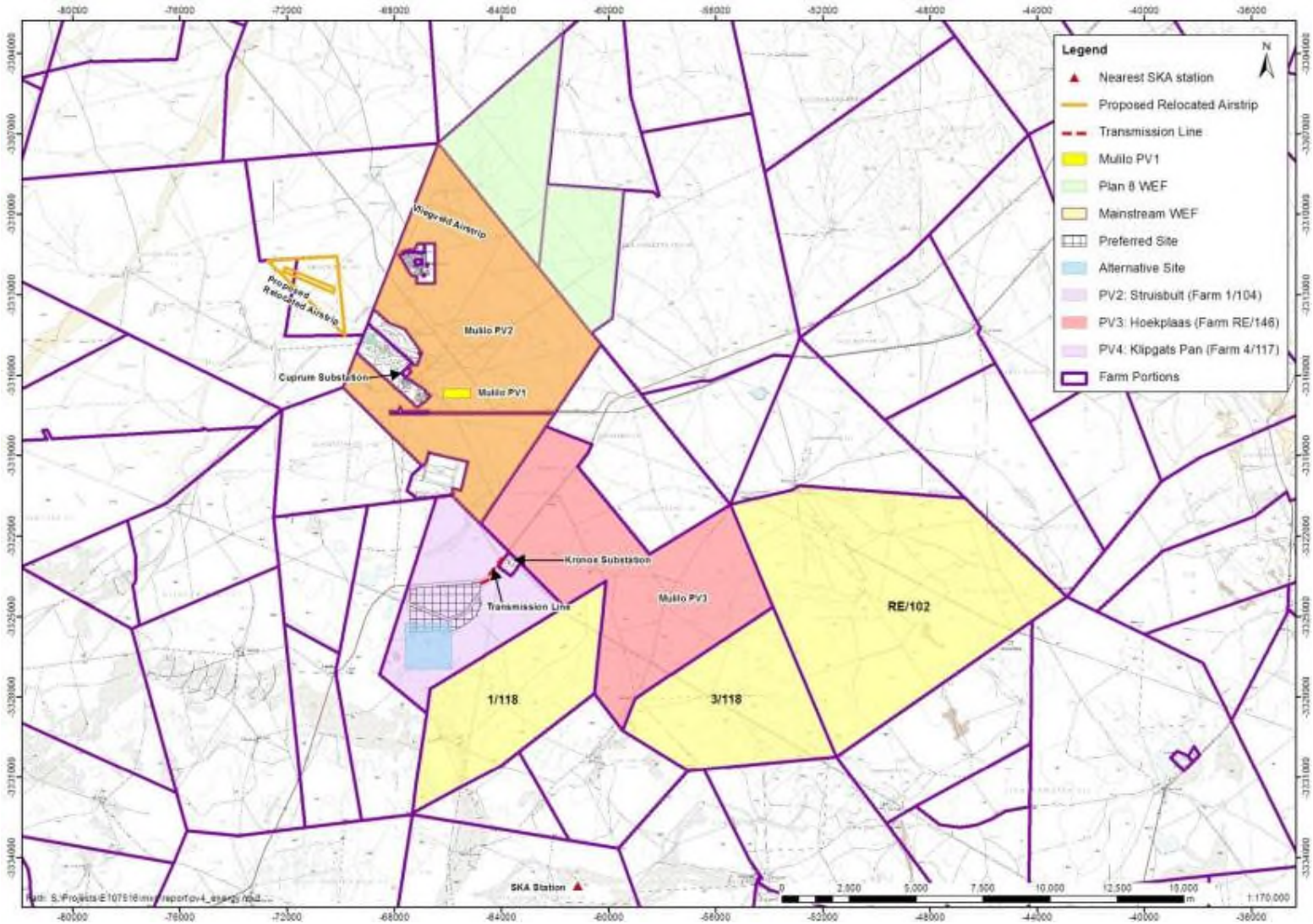



**Figure 2.7 Other renewable energy projects (solar and wind) proposed for the Copperton area**

The development of these layouts was based on *inter alia* the following criteria:

- Technical constraints
    - Spatial orientation requirements of solar panels and associated infrastructure (e.g. roads); and
    - Layout relative to other existing infrastructure.
- Environmental constraints
    - Topographical constraints, including surface and groundwater;
    - Botanical and avifaunal constraints (presence of sensitive or protected plant communities or avifauna);
    - Location of heritage (archaeology and palaeontology) resources; and
    - Aesthetics.

### *2.3.5 Technology alternatives*

Various technology alternatives were considered in terms of the following:

- Solar panel type: PV vs. Concentrated PV (CPV);
- Mounting system: trackers vs. fixed mount; and
- Foundation options: isolated concrete bases vs. continues concrete bases vs. concrete pile vs. thrusted supporting structures.

#### a) Solar panel type

Two solar panel types, i.e. conventional PV solar cells and CPVs, were considered for the proposed solar plant. The CPV technology consists of mega modules that use refractive lenses to concentrate direct sunlight onto smaller cells. These cells are able to generate electricity from a broader light spectrum than conventional PV technology and are thus more effective per ha than conventional PV technology, e.g. a minimum of 1.8 ha is required for CPVs to generate 1 MW of electricity compared to 3-7 ha required by conventional PV technology. The conventional PV technology on the other hand generates electricity by converting solar radiation energy into a DC current which then needs to be converted to an AC current to connect to the grid (see **Figure 2.8**)[22]. Approximately 1 kł of water would be required per day for every 10 MW during operation.

Both the conventional PV and CPV solar panels will be considered in this EIA.

[22] Source: http://en.wikipedia.org/wiki/Photovoltaics#Optimum_orientation_of_solar_panels and http://en.wikipedia.org/wiki/Concentrated_solar_power (Accessed on: 24/10/2011).

**Figure 2.8: Photovoltaic solar cells (left)[23] and a CPV system (right)[24] were considered for the proposed PV plant**

### b) Mounting system

Solar panels can be mounted in various ways to ensure maximum exposure of the PV panels to sunlight. In a fixed axis system the PV panels are installed at a set tilt and cannot move, whereas in a one or two (dual) axes tracking system the panels follow the sun to ensure maximum exposure to sunlight[25]. These systems are illustrated in **Figure 2.9**.

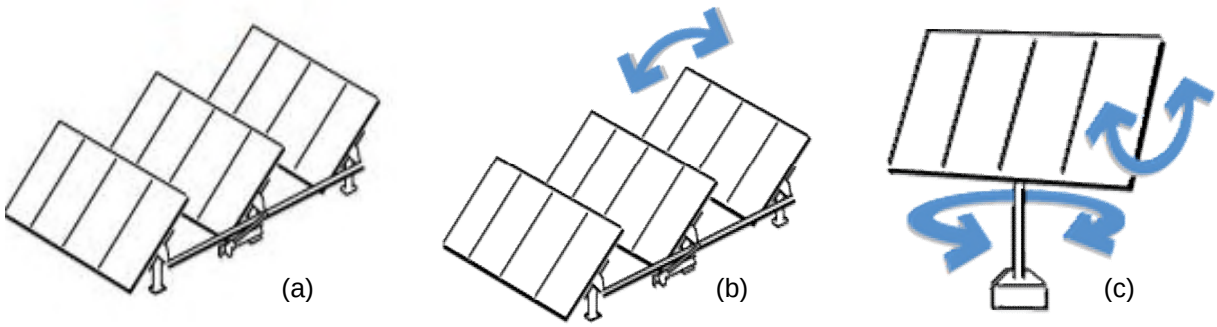



**Figure 2.9: Solar panels can be mounted via (a) fixed axis photovoltaic systems, (b) single axis tracking PV systems and (c) dual axis tracking systems[26]**

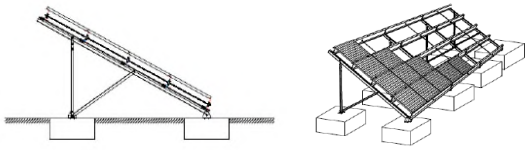
In order for CPVs to be cost efficient and produce the maximum amount of electricity, mega-modules have to be mounted on dual axis tracking systems. Therefore only the dual axis tracking system will be considered in the EIAR for the CPV panels. There is little environmental difference in terms of impacts from the various mounting systems, which could be considered for PV, and as such these will not be considered separately in this EIAR. The selection of the preferred mounting system should rather be based on technical and financial considerations.

[23] Photo of a test solar plant constructed by Mulilo on the town border of Copperton (Taken on: 29/09/2011)
[24] Source: http://gigaom2.files.wordpress.com/2010/04/amonix15.jpg (Accessed on: 13/02/2012)
[25] Source: http://en.wikipedia.org/wiki/Solar_tracker#Tracker_type_selection (Accessed on: 24 October 2011)
[26] Source: www.solar-tracking.com/ (Accessed on: 24/10/2011)

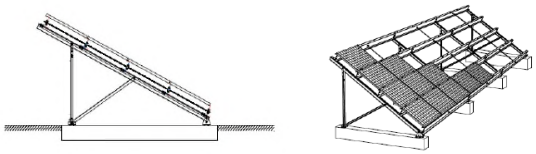
**c) Foundation options**

There are various methods for anchoring PV panels. However the preferred foundation option would be dependent on the soil characteristics of the area, as these anchoring structures would need to withstand climatic conditions, as well as the response of the soil to these changes, to prolong the lifespan of the panels. A geotechnical assessment would however be required to determine the soil conditions and the type of anchoring required. As this study will only be completed after the EIA Phase, the following anchoring options will be considered (see
Figure 2.10):

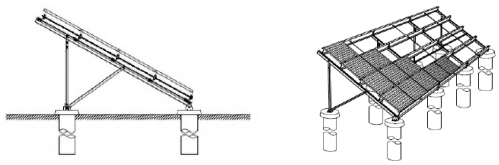
- Isolated concrete bases;
- Continuous concrete bases; and
- Concrete pile;
- Thrusted supporting structures.



(a) Isolated concrete bases



(b) Continuous concrete bases



(c) Concrete pile

(d) Thrusted supporting structure

**Figure 2.10: Illustrations of various anchoring options to be considered for the proposed PV plant (courtesy: Mulilo)**

### *2.3.6 Summary of alternatives*

To summarise, the feasible alternatives which are assessed in the EIAR include the following:

- Location alternatives:
  - One location for the proposed Klipgats Pan PV plant; and
  - Electricity distribution via a 1.66 km or 2.14 km 132 kV connection to Kronos substation.
- Activity alternatives:
  - Solar energy generation via a PV plant; and
  - "No-go" alternative to solar energy production.
- Site layout alternatives:
  - Two layout alternatives (preferred and alternative).
- Technology alternatives:
  - Two technology alternative in terms of the solar panel type (PV vs. CPV); and
  - Four foundation options.

# 3 THE PUBLIC PARTICIPATION PROCESS

The purpose of this Chapter is to provide an outline of the Public Participation Process, a summary of the process undertaken to date, and the way forward with respect to public participation as part of the EIA Phase of this project.

## 3.1 INTRODUCTION

Consultation with I&APs forms an integral component of an EIA process (see **Figure 1.2**) and enables *inter alia* directly affected landowners, neighbouring landowners, stakeholders, communities and interested parties to identify the issues and concerns relating to the proposed activity, which they feel should be addressed in the process. The approach to this public participation process, summarised in the Plan of Study for EIA (Chapter 5 of the FSR), has taken cognisance of the DEAT Guideline on Stakeholder Engagement (2002).

Public participation, as required in terms of the EIA Regulations can, in general, be separated into the following phases:

*Comment on Draft and Final Reports*
During the Scoping and EIA Phases, registered I&APs are provided with an opportunity to comment on draft and final versions of the reports. This is enabled by the lodging of the reports at suitable locations for review and invitations to public meetings/open houses to discuss the content of the relevant report.

*Decision and Appeal period*
This is the final phase of the public participation process. Once the competent authority has made their decision and issued an Environmental Authorisation, the applicant and I&APs are notified of the decision and have the opportunity to appeal to the national Minister of Water and Environmental Affairs, within the stipulated timeframes.

Progress with respect to these various stages for the current project is discussed in more detail below. It should be noted that the public participation process developed for this investigation meets the minimum requirements of NEMA.

All public participation related information is included in **Annexure B** of the EIAR.

## 3.2 SUMMARY OF THE PUBLIC PARTICIPATION PROCESS TO DATE

### *3.2.1 Initiation of the public participation process*

The approach adopted for the current investigation was to identify as many I&APs as possible initially, through a suite of activities, as follows:

- Placing advertisements in local newspapers (the Gemsbok);
- Placing a notice board at the site;

- Providing written notice and an Executive Summary to potential I&APs, including surrounding landowners, organs of state, ward councillors and relevant authorities;
- Informing I&APs registered for existing EIAs, being run by Aurecon in the area about the project and providing them with an opportunity to register for this project as well; and
- Requesting potential I&APs to recommend other potential I&APs to include on the database (chain referral process).

The initial database of I&APs was compiled using an existing database for the proposed wind energy facility on an adjacent site, through identification of neighbours and through liaison with the local municipality, personal communication with the landowner and other organisations in the area. The initial database included the landowner, neighbouring landowners, relevant district and local municipal officials, relevant national and provincial government officials, and organisations in the area. This database is augmented via chain referral, and is continually updated as new I&APs are identified throughout the project lifecycle. The current list of I&APs, comprising approximately 56 individuals and organisations, is included in **Annexure B**. The sectors of society represented by I&APs on the database are listed below.

(i) Provincial government (Northern Cape);
(ii) Local government (Siyathemba LM and Pixly ka Seme District Municipality);
(iii) Organised agriculture;
(iv) Business/Commerce;
(v) Industry;
(vi) Scientific and research based organisations
(vii) Local landowners; and
(viii) Local communities and other community based organisations in the project area.

Thereafter, the remainder of the communications was be focused on registered I&APs and on local advertising. Consequently, the initial advertising campaign was broad and thorough and invited the members of the public to register as I&APs.

### *3.2.2 Public participation related to the Scoping Phase (DSR)*

The public participation process was initiated at the Scoping Phase when the I&APs were notified of the DSR and associated comment period in the following way:

- Placement of advertisements in a local newspaper, the Gemsbok, notifying the broader public of the initiation of the EIA and inviting them to register as I&APs from 2 November 2010;
- Erection of a site notice at the entrance to Farm Klipgats Pan on 8 November 2011;
- Lodging the DSR at Prieska (Elizabeth Vermeulen) Public Library, Ietznietz Guest House in Copperton and on the Aurecon website from 8 November 2011. All registered I&APs were notified of the availability of the DSR by means of a letter sent by fax, post and/or

e-mail on 7 November 2011. The notification letters also included a copy of the Executive Summary of the DSR in English and Afrikaans;

- I&APs had 40 days, until 5 January 2012, to submit their written comments on the DSR.
- On 6 December 2011 a second notification letter was distributed to I&APs regarding the extension of the comment period from 5 January 2012 to 9 January 2012 due to a delay that occurred during the mailing of the first notification letters; and
- I&APs had 40 days, until 9 January 2012, to submit their written comments on the DSR. Cognisance was taken of all comments when compiling the final report, and the comments, together with the project team and proponent's responses thereto, were included in final report.

### *3.2.3 Public participation related to the Scoping Phase (FSR)*

Based on the comments received on the DSR during the 8 November 2011 to 9 January 2012 public comment period the DSR was updated and called the FSR. The second stage of the PPP involved the lodging of the FSR for review and comment at the same locations as the DSR.

- I&APs were provided with 21 calendar days to comment on the FSR between 18 January 2012 and 7 February 2012; and
- Registered I&APs were informed of the FSR public comment period via a letter dated 16 January 2012 which was emailed or posted. An Executive Summary together with an update page in English and/or Afrikaans was also emailed or posted to registered I&APs which highlighted the key changes made to the DSR as a result of the 40 day public comment period.

### *3.2.4 Issues and concerns raised during the Scoping Phase*

Issues were submitted during the DSR comment period from 8 November 2011 until 9 January 2012 and FSR comment period from 18 January 2012 to 7 February 2012. Comments and concerns raised by I&APs (with regards to the proposed activities) have been incorporated into CRR 1 (see **Annexure D** of the FSR) and CRR 2 (see **Annexure B**) which summarise all the issues and concerns raised by I&APs during the Scoping Process, and provide the project team and proponent's response thereto. The issues raised by I&APs to date relates to the processes required in terms of the NHRA and NWA.

### *3.2.5 Public participation related to the EIA phase (Draft EIAR)*

The Draft EIAR was lodged in Prieska (Elizabeth Vermeulen) Public Library, Ietznietz Guest House in Copperton and on the Aurecon website (www.aurecongroup.com - change "Current Location" to "South Africa" and follow the Public Participation link).

All registered I&APs were notified of the availability of the Draft EIAR by means of a letter sent by post, fax or e-mail on 10 April 2012. The notification letters also included a copy of the Executive Summary in English and Afrikaans.

I&APs had 40 days, from 10 April 2012 until 22 May 2012, to submit their written comments on the DEIR. Cognisance was taken of all comments in compiling the final report, and the comments, together with the project team and proponent's responses thereto, have been included in the final report. Where appropriate, the report has been updated.

### *3.2.6 Public participation related to the EIA phase (Final EIAR)*

Based on the comments received during the 40 day public comment period on the Draft EIAR, the report has been updated in light of the comments received and is called the Final EIAR. Comments on the Draft EIAR have been included and responded to in the CRR 3 which has been made available to I&APs.

The Final EIAR wasmade available for review at the same locations as the Draft EIAR for a further 21 day public comment period. Comments received on the Final EIAR were not included in a Comments and Response Report and were instead collated and forwarded directly to DEA.

Comments on the Final EIAR were directed to:

**Aurecon**
Franci Gresse or Louise Corbett
P O Box 494, Cape Town, 8000
Tel: (021) 526 6022
Fax: 086 723 1750
Email: franci.gresse@aurecongroup.com

## 3.3 REVIEW AND DECISION PERIOD

The Final EIAR will be submitted to DEA for their review and decision-making. DEA must, within 60 days, do one of the following:

- Accept the report;
- Notify the applicant that the report has been referred for specialist review;
- Request amendments to the report; or
- Reject the report if it does not materially comply with regulations.

If the report is accepted, DEA must within 45 days:

- Grant authorisation in respect of all or part of the activity applied for; or
- Refuse authorisation in respect of all or part of the activity.

Once DEA issues their decision on the proposed project, all registered I&APs on the project database will be notified of the outcome of the decision within 12 calendar days of the Environmental Authorisation having been issued. Should anyone (a member of public, registered I&AP or the Applicant) wish to appeal DEA's decision, a Notice of Intention to Appeal in terms of Chapter 7 of the EIA Regulations (GN No. 543) in terms of NEMA must be lodged with the Minister of Water and Environmental Affairs within 20 calendar days of the decision being issued and the substantive Appeal must be lodged within 30 days of the Notice.

# 4 ASSESSMENT OF POTENTIAL IMPACTS AND POSSIBLE MITIGATION MEASURES

This Chapter forms the focus of the EIAR. It contains a detailed assessment of the operational (or long-term) impacts as well as the construction phase impacts on the biophysical and socio-economic environments. A summary table of the assessment of all the potential impacts is also provided.

## 4.1 INTRODUCTION

This Chapter describes the potential impacts on the biophysical and socio-economic environments, which may occur due to the proposed activities described in Chapter 2. These include potential impacts, which may arise during the operation of the proposed development (i.e. long-term impacts) as well as the potential construction related impacts (i.e. short to medium term). The assessment of potential impacts will help to inform and confirm the selection of the preferred alternatives to be submitted to DEA for consideration. In turn, DEA's decision on the environmental acceptability of the proposed project and the setting of conditions of authorisation (should the project be authorised) will be informed by this chapter, amongst other information, contained in this EIAR.

The potential impacts identified during the Scoping Phase of this project, and updated where necessary, are as follows:

- Operational phase impacts on the biophysical environment:
    - Impact on flora;
    - Impact on avifauna;
    - Impacts fauna; and
    - Impact on freshwater resources
- Operational phase impacts on the social environment:
    - Visual impacts;
    - Impact on energy production;
    - Impact on local economy (employment) and social conditions;
    - Impact on agricultural land; and
    - Impact on surrounding land uses.
- Construction phase impacts on the biophysical and social environments:
    - Disturbance of flora, avifauna and fauna;
    - Sedimentation and erosion of water ways;
    - Impact on heritage resources (including palaeontology);
    - Impact on traffic;
    - Noise pollution;
    - Storage of hazardous substances on site; and
    - Dust impact.

Each of these impacts is assessed in detail in a section below. The baseline and potential impacts that could result from the proposed development are described and assessed. Mitigation measures are recommended. Finally, comment is provided on the potential cumulative impacts[27] which could result should this development, and others like it in the area, be approved.

Please note that specialists assessments have been completed on the original preferred layout and technology alternatives as presented in the FSR. These layouts and technology alternatives were updated based on specialist input and a DoE emphasis on local procurement. Specialists have provided written confirmation that their assessments are not significantly impacted on by these changes to alternatives, and this confirmation is included in the relevant annexure along with their report. It should however be noted that the Visual Impact Assessment was updated with the revised technology alternative (CPV) due to the significant changes on this aspect resulting from the new preferred technology. The revised layouts and technology alternatives are assessed below.

The methodology used to assess the potential impacts is detailed in **Annexure E** of the FSR. The (+) or (-) after the significance of an impact indicates whether the impact is positive or negative, respectively.

## 4.2 OPERATIONAL PHASE IMPACTS ON THE BIOPHYSICAL ENVIRONMENT

### *4.2.1 Impact on flora*

The principle vegetation type on Farm Klipgats Pan, which shows some variation, is Bushmanland Basin Shrubland. The main agricultural activity is sheep-farming but despite the very dry conditions the vegetation is in fair condition with only certain areas, such as watering points, more heavily trampled than elsewhere. Two different locations south of the R357 were considered for the proposed solar energy facility that would cover an area of 300 ha. The potential therefore exists for the footprint of the proposed solar energy facility to impact on the vegetation of Farm Klipgats Pan. As such Dr Dave McDonald of Bergwind Botanical Surveys & Tours CC was appointed to undertake a desktop Botanical Impact Assessment. A site visit was conducted by Dr McDonald on the 24 November 2011 to inform the assessment. The study considered locality, topography, geology, climate vegetation types and conservation status. The Botanical Impact Assessment, and comment on the revised layout and technology alternatives, is included in **Annexure C**. The summary below includes findings and recommendations of the specialist.

#### a) Description of the environment

The Klipgats Pan site falls within the Nama Karoo Biome which covers a large part of the Northern Cape Province. According to the national classification of the vegetation of South

[27] EIAs are typically carried out on specific developments, whereas cumulative impacts result from broader biophysical, social and economic considerations, which typically cannot be addressed at the project level.

Africa (Mucina *et al.* 2006 in Mucina and Rutherford, 2006) the vegetation found at the study site is mainly Bushmanland Basin. Although there are few statutory conservation areas in this type, it forms agricultural rangelands and is conserved for its grazing potential. The National Spatial Biodiversity Assessment (Rouget *et al.* 2004) classifies this vegetation type as Least Threatened and it is not listed in the National List of Threatened Terrestrial Ecosystems (Government Gazette No. 34809. 2011).

Klipgats Pan has a very low relief that increases slightly towards the west of the northern part where a low rise of calcrete forms a band that impedes drainage. The drainage system arises on the neighbouring farms, Struisbult and Hoekplaas, towards the north-east and east. On Klipgats Pan it forms a wide and shallow seasonal drainage line. No rare plant species or plant species of special concern were found during the survey. Anderson (2010) found three protected species in a survey of Portion 1 of Farm Vogelstruisbult No. 104 northeast of Klipgats Pan. These species, *Avonia albissima*, *Lithops hallii* and *Ruschia spinosa* may occur at Klipgats Pan, but if so would most likely be in the northwest sector on the calcrete ridges.Two vegetation communities occur across the preferred (1) and alternative (2) sites, namely *Rhigozum trichotomum* (granaatbos) and Asteraceous Shrubland. The *Rhigozum trichotomum* (granaatbos) is a tough woody shrub and is scattered throughout the study area (see **Figure 4.1**) but tends to be concentrated and dominant in areas where there is an accumulation of red sand and surface rocks. The Asteraceous Shrubland is the most extensive vegetation type in the study area and it also has the greatest diversity of species. Since this vegetation indicates a shallow-wash drainage line it is considered to be more ecologically sensitive than the broader vegetation described below as Asteraceous Shrubland.

**Figure 4.1: Photographs of the two main vegetation types occurring at Klipgats Pan, i.e. *Rhigozum trichotomum* Shrubland (left) and low shrubland dominated by members of the Asteraceae / daisy family (right) (D. McDonald, 24/11/2011)**

The Asteraceous Shrubland is the most extensive vegetation type in the study area. It also has the greatest diversity of species, mainly low shrubs with grasses occurring patchily. Other herbaceous species are also present. This vegetation occurs on shallow sandy-loam soils often with bedrock (mostly as hardpan calcrete) and is not ecologically sensitive. Within the low shrublands are patches where grasses, mainly of the genus *Stipagrostis,* are

abundant. However, due to grazing grasses are less abundant than would be the case if the land was not grazed (see **Figure 4.1**).

Towards the northern section of Klipgats Pan Farm the invasive tree species *Prosopis glandulosa* (mesquite) is present as large trees, concentrated around a windmill (see **Figure 4.2**). This tree species is originally from North and Central America and is particularly invasive in the arid areas of South Africa. *P. glandulosa* could become a serious problem if allowed to spread. No other alien invasive species were recorded.

**Figure 4.2: A stand of *Prosopis glandulosa* (mesquite) on Klipgats Pan Farm (D. McDonald, 24/11/2011)**

The greater part of Klipgat Pan is not botanically sensitive. However, one important exception is the low-lying drainage area which extends from the northeast corner to the center of the northern part of the farm. This seasonal watercourse may remain dry for long periods but could also flood after heavy rain. It has a higher sensitivity than the surrounding low Asteraceous shrublands and probably also provides a more attractive habitat for small mammals and birds.

**b) Impact assessment**

The potential impacts of the proposed project on the vegetation on Farm Klipgats Pan would include the loss of vegetation type (plant species) and habitat as well as the loss of ecological processes. If the proposed solar facility is constructed, most of the vegetation over a 200 ha area would be lost. In addition there would also be some loss of vegetation due to trampling and movement of vehicles. Furthermore, findings of the survey indicate that a triangular area in the northwest corner of Klipgats Pan is more sensitive due to the occurrence of the drainage system.

Based on the above, the potential impact of the proposed project on vegetation is considered to be of a low magnitude, local extent and long term, and thus of a **low (-)** significance with and without mitigation for all alternatives.

**c) Mitigation measures**

The following mitigation measures are recommended:

- A rehabilitation plan for the site should be compiled with the aid of a rehabilitation specialist and adhered to; and
- Shallow depressions and well defined pans should be avoided, with buffer zones of at least 30 m around pans.

**d) Cumulative impacts**

Bushmanland Basin Shubland is not a threatened vegetation type and despite the numerous proposed renewable energy projects in the Copperton area, the status of this vegetation type would not change. Cumulative impacts on this vegetation type due to the Klipgats Pan solar energy project would be of a low magnitude, local extent and long term, and thus of a low (-) significance.

### *4.2.2 Impact on avifauna (birds)*

At least 215 bird species are likely to occur in the area, of which 68 are endemic or near endemic species, 18 red listed species and five species are red listed endemics. The expected impacts of solar energy facilities on avifauna are related to footprint impacts associated with:

- Habitat destruction;
- Disturbance by construction and maintenance activities and possibly by the operation of the facility; and
- Displacement or disturbance of sensitive species.

In addition, some bird species may interfere with the efficient running of the proposed PV installation. As such an avifaunal study was undertaken by Dr Andrew Jenkins of Avisense Consulting. A desktop review of relevant literature and a site visit on 7 January 2012 informed the avifaunal study. The avifaunal study, and comment on the revised layout and technology alternatives, is included in **Annexure C**. The findings and recommendations of the avifauna study are summarised below.

**a) Description of the environment**

The broader impact zone of the proposed PV facility is contained within an extensive tract of undulating, remote, arid environment, while the immediate vicinity features degraded

natural veld with some anthropogenic influences. The broader area could support over 200 bird species, including up to 18 red-listed species, 68 endemics, and five red-listed endemics. The birds of greatest potential relevance and importance are likely to be local populations of endemic, and possibly red-listed passerines, seasonal species, locally resident of passing raptors and possibly over-flights of commuting wetland birds (see **Table 4.1**).

**Table 4.1: List of priority bird species that could potentially occur on site (Avisense Consulting, 2012)**

| Common name | Scientific name | SA conservation status & Global conservation status | Regional endemism | Estimated importance of local population |
|---|---|---|---|---|
| Ludwig's Bustard | *Neotis ludwigii* | SA: Vulnerable<br>Global: Endangered | Near-endemic | Moderate-High |
| Kori Bustard | *Ardeotis kori* | SA: Vulnerable | - | Moderate |
| Tawny Eagle | *Aquila rapax* | SA: Vulnerable | - | Low |
| Martial Eagle | *Polemaetus bellicosus* | SA: Vulnerable<br>Global: Near-threatened | - | Moderate-High |
| Secretarybird | *Sagittarius serpentarius* | SA: Near-threatened<br>Global: Vulnerable | - | Moderate |
| Lanner Falcon | *Falco biarmicus* | SA: Near-threatened | - | Moderate |
| Greater Flamingo | *Phoenicopterus ruber* | SA: Near-threatened | - | Low |
| Lesser Flamingo | *Phoenicopterus minor* | SA: Near-threatened | - | Low |
| Red Lark | *Calendulauda burra* | SA: Vulnerable<br>Global: Vulnerable | Endemic | Low |
| Sclater's Lark | *Spizocorys sclateri* | SA: Near-threatened | Endemic | Moderate |

Other potential birds include over-flights of commuting wetland birds such as flamingos. Pigeons, crows, weavers, sparrows and some raptor species may perch, roost, forage or even nest on or around the facility and cause fouling problems. It should be noted that the site is on the southern edge of a recent range expansion by Sociable Weaver (*Philetarius socius).* The huge communal grass nests built by this species may require active management if any are attached to critical infrastructure of the development.

Surveys of large raptors nesting on the steel pylons supporting Eskom's transmission lines in the area place regularly active Martial Eagle nests within about 3-4 km east of the proposed development area (on tower 512 of the Hydra-Kronos 400 kV line), and within about 18 km to the west (on tower 392 of the Aries-Kronos 400 kV line) .

Greater Kestrels have been found breeding in Pied Crow (*Corvus alba)* nests on 132 kV power poles, and Southern Pale Chanting Goshawk (*Melierax canorus)* nests have been found in trees along drainage lines within/close proximity to the proposed development area. An adult Martial Eagle was seen perched on the 132 kV power poles just outside the development area on 7 January 2012. Densities of regional endemics such as Northern

Black Korhaan (*Afrotis afraoides)*, Karoo Korhaan (*Eupodotis vigorsii)*, Sabota Lark (*Calendulauda sabota)*, Eastern Clapper Lark (*Mirafra fasciolata)*, Spike-heeled Lark (*Chersomanes albofasciata)* and Rufous-eared Warbler (*Malcorus pectoralis)* may be particularly high in the area. In addition one Ludwig's Bustard (*Neotis ludwigii)* collision victim was found under a 132 kV power line in the vicinity.

Overall, the avifauna of the development site itself is entirely replaceable, at best replicating that which occurs across huge areas of the Bushmanland. Given the nomadic nature and huge space requirements of birds in this semi-arid environment, and given that the area directly affected by the proposed development is relatively small and homogeneous in nature, it is unlikely to support any significant populations of any priority species.

**b) Impact Assessment**

The potential impacts of the proposed project on birds include habitat loss, disturbance and displacement of sensitive species by maintenance activities and possible operation of the facility.

*Habitat loss – destruction, disturbance and displacement*
Given the considerable space requirements of commercially viable facilities the most significant potential impact on birds of any solar energy generation facility is the displacement or exclusion of threatened, rare, endemic or range-restricted species from critical areas of habitat. The effect could be significant in some instances, particularly given the possibility that the initial footprint of successful facilities may be expanded over time, and allowing for the possible cumulative effects of multiple facilities in one area.

Also, power line service roads or servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, and to prevent vegetation from intruding into the legally prescribed clearance gaps between the ground and the conductors.

*Other effects*
Vertical, reflective surfaces may confuse approaching birds with the result that birds are killed in collisions with such surfaces. Solar installations generally feature large areas of reflective panelling. It is possible that nearby or overflying birds may be disorientated by the reflected light, and consequently be displaced from an area more extensive than just the developed footprint of the facility.

Conversely, certain bird species may be attracted to the solar arrays. The possibility also exists that waterbirds would mistake the reflective surface for an expanse of water, and attempt to land on the panels, incurring injury and/or being disorientated in the process. Other species may seek to benefit from the installations, using the erected structures as prominent perches, sheltered roost sites or even nesting sites, and possibly foraging around the infrastructure in response to changes in the distribution of preferred foods (plants

growing under the paneling, other animals attracted to the facility). Such scenarios might be associated with fouling of critical components in the solar array, bringing local bird populations into conflict with the facility operators. Under these circumstances, specialist advice should be sought in devising effective avian deterrents to minimize associated damage.

Specific impacts of the proposed site are most likely to be manifested in the following ways:

- Disturbance and displacement of resident/breeding raptors (especially Martial Eagle and possibly Lanner Falcon) from nesting and/or foraging areas;
- Disturbance and displacement of resident/breeding Karoo endemics (including Sclater's Lark and possibly even Red Lark);
- Disturbance and displacement of seasonal influxes of large terrestrial birds (especially Ludwig's Bustard and Kori Bustard) from nesting and/or foraging areas; AND
- Injury or mortality of wetland birds (especially flamingos) using possible flight lines in and out of resource areas in the broader vicinity, in collisions with the PV infrastructure.

Generally, however, the anticipated impacts on birds of the proposed development are not considered to be of any great significance. There would be some habitat loss for Karoo endemic species (although the general area at the site is already somewhat degraded and disturbed by past mining activities), some species (Karoo endemics, large terrestrial species, raptors) may be displaced from a broader area either temporarily or more permanently by the disruptive, reflective properties of the solar panels. There is also a possibility that some species (large terrestrial species, raptors, commuting wetland birds) may be killed in interactions (collisions, electrocutions) with the new power infrastructure, but again, numbers affected are likely to be low.

Based on the above the potential impact on birds due to habit loss and displacement is considered to be of low to medium magnitude, local extent and long term and therefore **low to medium (-)** significance without mitigation for all alternatives. With the implementation of mitigation measures this is anticipated to reduce to **low (-)** significance.

Based on the above the potential impact on birds due to mortality is considered to be of medium magnitude, regional extent and long term duration and therefore **low to medium (-)** significance without mitigation for all alternatives. With the implementation of mitigation measures this is anticipated to reduce to **low (-)** significance.

### c) Mitigation measures

The following mitigation measures are recommended:

- Minimize the footprint of the development;
- Minimize noise and disturbance associated with maintenance activities at the plant once it becomes operational

**d) Cumulative impacts**

All the potential impacts identified above are likely to be enlarged should there be additional renewable energy projects in the area. Therefore the potential impact on birds is considered to be of medium-high magnitude, local extent and long term and therefore of medium-high (-) significance, without mitigation. With the implementation of mitigation measures for each potential project proposed in the area, this is anticipated to reduce to low-medium (-) significance.

### *4.2.3 Impact on fauna*

Animals likely to be found on site and the surrounding environment are likely to include small antelope, mongoose, Black-backed Jackals, Caracal, snakes, etc. Various faunal species, or evidence of these animals, were observed during a site visit on 29 September 2011, namely Black Korhaan, Meerkat, Pied Crow, Steenbok and various pipits and larks. The farmer also indicated that Black-backed Jackal, Aardvark, Aardwolf, Brown Hyaena and Small Spotted Cat (also called the Black-Footed Cat) occur in the area. The International Union for Conservation of Nature (IUCN) Red List lists the Black Footed Cat as Vulnerable and the Brown Hyena is listed as Near Threatened (IUCN, 2011). The Black-footed Cat is a specialist of open, short grass areas with an abundance of small rodents and ground-roosting birds, and hence is likely to breed and feed in the area. The Brown Hyena is more likely to be an occasional visitor to the area as its presence would have been noticed by local farmers due to its relatively large size and it is likely the local farmers would have tried to kill any hyena based on common negative perceptions of this animal.

Black-footed cats are threatened primarily by habitat degradation by grazing and agriculture, as well as by poison and other indiscriminate methods of pest control (IUCN, 2011). Brown Hyena are often shot, poisoned, trapped and hunted with dogs in predator eradication or control programmes, or inadvertently killed in non-selective control programmes (IUCN, 2011).

Vegetation is generally accepted to be a proxy for biodiversity- the distribution of threatened species and communities is closely aligned with areas where indigenous vegetation has been extensively cleared (Department of the Environment, Water, Heritage and the Arts, 2008). As the vegetation types on site are generally of fair condition and are widespread it is unlikely that other animals occurring within these vegetation types would be rare or endangered.

**a) Impact assessment**

The proposed project would have a footprint of approximately 200 ha or 11.42 % of the site. The density of the proposed project would also be very high, with project components, and in solar panels, located close together. The entire 200 ha would be cleared which would result in the disturbance of animals and / or habitats. However due to the mobility of fauna

the impact is likely to be limited. Operation and maintenance of the proposed project would entail very few or rare on site activities and as such disturbance of animals and / or habitats are likely to be very limited. Existing human activities in the area are likely to have habituated most animals to the presence of humans and as such it is anticipated that any disturbance would result in animals leaving an area for a short period, if at all, and returning once the disturbance has passed. As such the potential impact of the proposed project on fauna is considered to be of low magnitude, local extent and long term (and therefore of **low (-)** significance, with or without mitigation for all alternatives.

**b) Mitigation measures**

The following mitigation measure is recommended:

- Small ground level openings, 20-30 cm in height, should be allowed for in the electrical fence to facilitate the movement of small mammals and reptiles through the site.

**c) Cumulative impacts**

Although a number of energy projects are proposed for the area, these are widely spaced apart and are unlikely to result in cumulative impacts on animals.

### *4.2.4 Impact on surface water resources*

The study area falls within the D54D quaternary catchment and the Lower Orange water management area (part of the Hartbees River system). The site is generally flat to gently sloping, with drainage areas and a few endorheic (inward flowing) pans which contribute to the biodiversity of the area. These pans are an important wildlife habitat, particularly for birds (especially migratory birds), mammal species and invertebrates. Since the proposed solar energy facility would either pipe or truck water in from outside sources, water use of the water resource at the site would be insignificant. However, the additional water spilled to the soil surface from washing of solar panels has the potential to elevate soil erosion and / or alter soil chemistry. As such MacKenzie Ecological and Development Services was appointed to undertake an Aquatic Ecology Impact Assessment. A site visit was conducted on 8-10 November 2011. The study considered the aquatic ecology, delineation of riparian zones or wetlands, climate, geology and soils. The Aquatic Ecology Impact Assessment, and comment on the revised layout and technology alternatives, is included in **Annexure C**. The summary below includes findings and recommendations of the specialist.

Furthermore, SiVest SA (Pty) Ltd was also appointed to carry out a desktop study of the surface hydrology of the proposed site for the proposed project. In the absence of a comprehensive geotechnical investigation, conclusions were drawn from a previous geotechnical investigation carried out on the adjacent property in August 2010.

**a) Description of the environment**

Numerous ridges and valley lines are located on the site, with all the valley lines draining in a westwards direction towards the adjacent Uitspan Pan farm. The area also includes pans that are typical endorheic[28] (see **Figure 4.3**) and ephemeral (seasonal) to various degrees. *P. glandulosa* (mesquite), an invasive alien plant, already exists on the farm and is associated with areas of elevated wetness and inundation, i.e. is preferentially associated with wetland and riparian areas. *P. glandulosa* is a deep-rooted tree that utilises groundwater. *P. glandulosa* alters the species composition in its vicinity (by excluding indigenous flora) and promotes open, more erodible, sub-canopy areas. Due to its provision of shade, these areas also tend to get highly trampled by livestock which exacerbates potential erosion.

It is expected that the existing drainage valley line would host a 1:100 year flood. Modelling would be required to determine where the floodline lies as there is evidence of previous flooding along this drainage line.

*Climate*

The study area occurs in the Northern Cape near the town of Copperton. The area has an arid continental climate with a summer rainfall regime. Mean annual precipitation (MAP) is approximately 176 mm with peaks in late summer, usually in March. The region typically experiences hot days and cold nights with the average summer temperature of approximately 33 ºC and the average winter night time temperatures of approximately 1 ºC. Most of the rainfall is confined to summer and early autumn.

**Figure 4.3: A typical endorheic pan with an unvegetated centre characterised by open sediments and boulders (J. MacKenzie, 8/11/2011)**

[28] A class of wetland, DWA 2005

*Geology*

Soils are generally base-rich, weakly structured and shallow. They drain freely, usually with less than 15% clay and have characteristic high levels of salt (Mucina and Rutherford, 2006).

**b) Impact assessment**

The footprint of the proposed solar facility would result in the loss of 200 ha on the Farm Klipgats Pan. The proposed facility has the potential to change the water balance in the immediate vicinity since average annual rainfall is so low and panel washing activities would introduce additional water (which supersedes rainfall) to the runoff surface. Additional water to a cleared surface has the potential to erode surface substrates (presumably bare soil in this case), but would also result in a change in vegetation composition as vegetation (including alien species) would readily colonise the area due to elevated and regular soil moisture availability.

Also, since the medium for washing would be water mixed with a mild detergent, the potential exists for altered water quality to nearby areas, depending on how runoff is dealt with and the exact dilution and chemical nature of the mix.

Consequently the overall impact of the proposed project on the study area's aquatic ecology is considered to be of medium magnitude, local extent and long term and therefore of **medium (-)** without mitigation, for all alternatives. With the implementation of mitigation measures the significance of the impact would reduce to **low (-)** for all alternatives.

In terms of stormwater management, the three potentially different methods of fixing the PV panels to the ground would determine the impact of surface stormwater and how it should be managed. The Fixed Axis System and Single Axis System are structures close to the ground and would require some bulk earthworks and clearing of existing vegetation to construct the terraces. The Dual Axis System would not require any bulk earthworks and removal of vegetation and minimal stormwater measures would be required.

The clearance of vegetation would increase the total volume of stormwater run-off emanating from the cleared area and may result in soil erosion. The volume of stormwater runoff from the site would also increase due to the large area covered by the impermeable surface area of the solar panels. Local scouring or erosion could occur beneath the solar panels where water falls directly from the solar panels on soil (without plant cover). Gravel access roads may also be vulnerable to erosion by stormwater run-off.

Considering the above, the potential impact of stormwater is considered to be of medium intensity, local extent, long term and therefore of **medium (-)** significance, without mitigation, for all alternatives. With the implementation of mitigation measures this impact would reduce to **very low (-)** for all alternatives.

### c) Mitigation measures

This impact has both a quantity and quality component, and the severity of each depends on factors which are not exactly known, i.e. the potential of falling water to erode soils would depend on the nature of the application and the erodability of the substrate, and the alteration to soil chemistry would depend on the dilution and chemical nature of the washing medium.

The following mitigation measure is recommended:

- Monitoring, together with the development of an environmental management plan as operation proceeds will be the most effective strategy;
- Monitor both soil chemistry and erosion and mitigate if required;
- Implement erosion control measures should there be evidence of erosion;
- Should soil chemistry be affected (this is likely to be an increase in salinity), the nature of the washing mixture could be changed, or acceptable waste treatment employed;
- Remove perennial alien species such as *P. glandulosa* at sites disturbed or cleared, or where panel washing occurs;
- Install composting toilets that does not require water, septic tanks or soak-aways;
- Stormwater channels and "mitre" chutes should be constructed to direct the stormwater flows and minimize and control erosion. Each catchment covered by the site should have a separate drainage system and associated detention pond;
- Gravel roads should be graded and shaped with a 2 % crossfall back into the slope, allowing stormwater to be channelled in a controlled manor towards the natural drainage lines;
- Where roads intersect natural, defined drainage lines, suitably sized pipe culverts or drive through causeways should be installed or constructed;
- The minor storm design period should be used to determine the size of the earth channels. A return period of 1:5 years is applicable which approximates to an average intensity of 29 mm/hour; and
- The major storm occurrence (i.e. 1:25 year, 1:50 year & 1:100 year) should be used to calculate culverts in defined drainage lines and determine flood levels where necessary. The intensities for each occurrence are: 1:25 year – 45 mm/hour, 1:50 year – 52 mm/hour and 1:100 year – 60 mm/hour respectively.

### d) Cumulative impacts

A number of other renewable energy applications are proposed in the general area, including a number of PV projects. Although these sites are distributed fairly widely, many would ultimately impact on the same drainage systems. However, since the proposed project will either pipe or truck water in from outside sources in order to wash the solar panels, water use of the water resource at the site will be insignificant. Monitoring, together with the development of an environmental management plan as operation proceeds, will be the most effective strategy to limit any cumulative impacts on the surrounding environment.

Furthermore, with the implementation of the proposed mitigation measures it is considered unlikely that stormwater would significantly impact on these drainage systems. As such the cumulative impact is considered to be of low magnitude, local extent and long term and therefore of low (-) significance.

## 4.3 OPERATIONAL PHASE IMPACTS ON THE SOCIAL ENVIRONMENT

### *4.3.1 Visual impacts*

The area surrounding the site is located at some 1 100 – 1 200 m above mean sea level. The area is gently undulating to flat, with a very gradual slope east to west. The landscape is covered in shrubs with a few sparse trees. Any tall structures, such as existing powerlines, are visible for many kilometres. The potential therefore exists that the proposed PV plants and associated infrastructure would be visible from many kilometres away. As such Mr Steve Stead, a private consultant, was appointed to undertake a Visual Impact Assessment (VIA) to determine potential visual impacts of the proposed project. The site was assessed, and also general areas of the locality from where the site appeared to be likely to be visible during the months of April and May 2013. The VIA on the updated site layout is contained in **Annexure C**.

**a) Description of the environment**

The overall landscape is defined as wide open, flat, remote, sparsely populated land, typical of the rural open plains of the Karoo. The landscape is covered in grasslands and scrub with few scrubs on site and few trees, apart from those planted around Copperton and the farmhouses. The dominant land use is agriculture with pasture mainly for sheep, goats and a few cattle.

The town of Copperton, a small settlement consisting of about 42 single storey houses and an estimated 1.5 $km^2$ in extent, is situated close to the mine. The disused copper mine is situated approximately 4 km to the north of the proposed site and occupies about 4.5 $km^2$. The remaining built structures consist of a tall mineshaft, a large, tall concrete shed, concrete storage tanks and unused lighting pylons. Existing vertical elements in the landscape are the lines of transmission pylons leading to and from existing substations, telegraph poles, the mine shaft and other tall and bulky remnant mine buildings. These bring some industrial character into this rural area.

Alkantpan is situated 13 km from the site, south west of Copperton and consist of a high security area with low concrete bunkers and low observation buildings. A few scattered farmsteads are within 5 km of the site, although not all are still regularly inhabited.

A landscape may be valued for many reasons, which may include landscape quality, scenic quality, tranquillity, wilderness value, or consensus about its importance either nationally or locally, and other conservation interests and cultural associations. The site landscape

appears to have some value for its grazing. However the site does not have a strong or identifiable sense of place, although it would be valued to a degree for scenic remoteness. The 5 km viewshed considered for the proposed development includes transportation corridors, local places of habitation and work and includes the development site and peripheral areas, including Kronos, and the R357 and local gravel roads.

**b) Impact assessment**

The proposed development would consist of an extensive installation of PV panels installed south of the R357 in a rural area. Both the preferred and alternative sites are for a 100 MW plant that would occupy 300 ha. The development includes security fencing, internal roads, single storey buildings and a sub-station. The proposed sites are situated 10 km from the settlement of Copperton, and 7 km from the abandoned mine.

The proposed development is a semi-industrial land use and would be located in an agricultural landscape, although there are industrial uses in the vicinity. The preferred site is located adjacent to the R357 and the alternative site approximately 1.5 km to the south of the R357. It would be especially visible to users of the R357 road.

The degree to which the proposed project would be visible is determined by the height of the infrastructure and extent of the area under development. Visibility is moderated by the distance over which this would be seen, the weather and season conditions and some back-grounding effect from the environment. Factors affecting visibility are the open quality of the site and the surrounding land uses and land cover.

Visual exposure refers to the visibility of the site in terms of the capacity of the surrounding landscape to offer screening. This is determined by the topography, tree cover, built form, etc. In the case of both the proposed layout alternatives the visual exposure is high as there is little screening offered by the landscape.

The Zones of Visual Influence or Theoretical Visibility (i.e. the affected area) for the proposed project is considered to be high as it would influence the view and act as a visual focus. These zones or viewsheds are recorded in **Figure 4.4**.

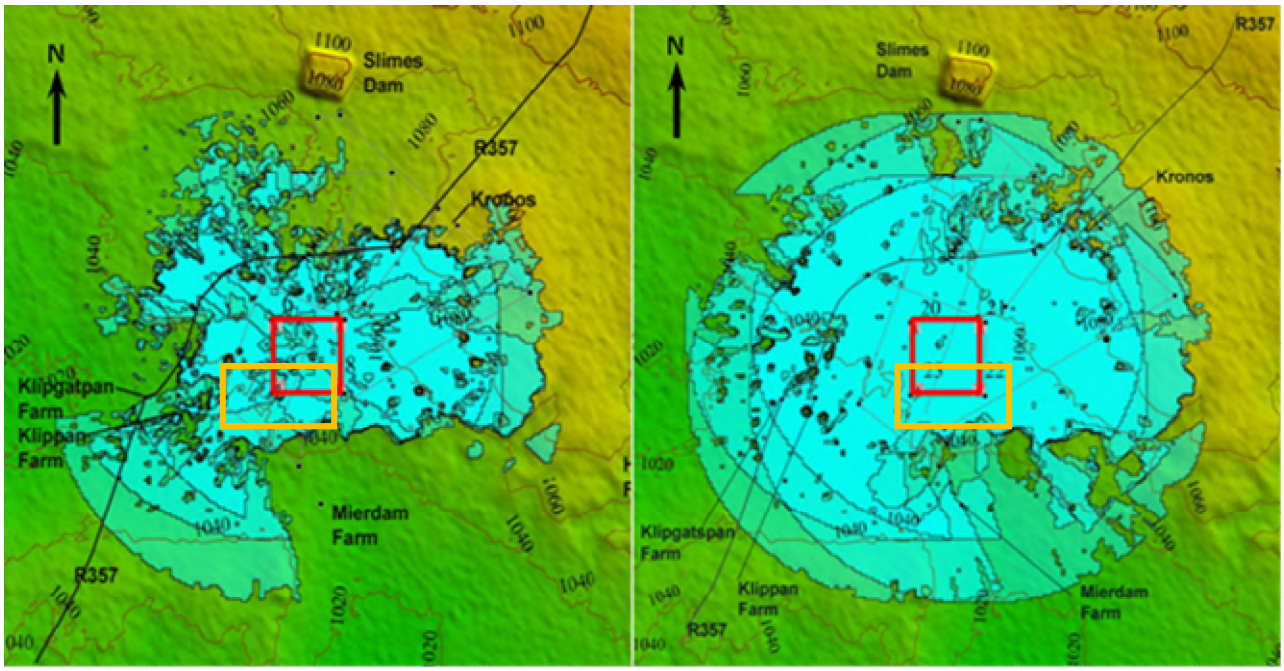



**Figure 4.4: Maps showing the visual envelope calculated at a radius of 5 km with 4 m (left) and 15.4 m (right) high panels (K. Hansen, 2012[29])**

There are no receptors on the site itself and lands around the site, apart from people working on the farm and Eskom maintenance operatives. The farmsteads of Klipgats Pan and Klippan are within 5 km of the sites and would thus be visually impacted upon.

The impact on the users of the R357, local tarred roads and a number of gravel roads would be different for the preferred and alternative layouts. For the preferred layout, with 4 m high PV modules, the southbound traffic on the R357 would see the development closely by looking ahead and to the side. For a distance of about 4.2 km the view would last about 2.5 minutes if driving at 100 km/h. Northbound traffic would look straight at the development as they approach from the south and to the side. The buildings and access road associated with the development would also be seen.

The local gravel road linking the R357 at farm Klipgats Pan with farm Klippan and an eastwards farm Mierdam does not lie within the viewshed. The local tarred road aligned north-south and linking the mine to the north with the R357 runs about 1.5 km to the west of the site and the proposed project would be held in view by drivers for about 3 km or about 2 minutes.

For the alternative layout (4 m high panels) the southbound traffic on the R357 would hold the development in view for a distance of about 5 km for about 3 minutes. Northbound traffic would view the development over a driving distance of about 10 km and for 6 minutes. In each direction the alternative layout would be noticed for a longer period of time because the development would be more extensive. The development would be visible for

[29] Note that these maps are the same for the preferred (orange) and alternative (red) layouts as no significance difference results for the location alternatives

about 4 km or 3 minutes, travelling either west or east. This layout would be intermittently visible to the local tarred road discussed above.

**Figure 4.5** shows a photomontage of the alternative layout with and the proposed Mainstream wind energy facility in the background. According to the specialist impacts associated with the preferred layout would not affect a greater geographical area than the alternative layout.


**Figure 4.5: Anticipated view of the proposed alternative site from the gravel road off the R357 which heads east towards Mierdam Farm. The view for the preferred layout would be very similar (K. Hansen)[30]**

Due to the scale of the development, the numbers and types of receptors directly affected and the semi-industrial nature of the proposed project which is compatible with the industrial uses locally the potential visual impact is considered to be of medium to high intensity, local extent and long term and therefore of **medium to high (-)** significance, without mitigation for all alternatives. With the implementation of mitigation measures the intensity would be reduced to low to medium and as a result reduce the significance of the visual impact to **medium to low (-)** for all alternatives.

### c) Mitigation measures

The following mitigation measures are recommended:

- All excess material shall be removed off-site, and all the ground shall be returned to original levels/gradients as far as possible;
- New structures should be placed where they are least visible to the greatest numbers of people, in places where the topography can offer shielding, where possible;
- Visibility of buildings and the local sub-station should be reduced by cladding the buildings in non-reflective colours and materials that will blend in with natural environment. E.g. cladding with local stone or plaster and paint with earthy tones for

[30] Note that no suitable image could be found for PV panels, hence text has been used to illustrate the scale of the proposed project.

paint colours, roofs should be grey and non-reflective and doors and window frames should reference either the roof or wall colours;
- Finishing materials of the infrastructure (including support structures) should be of colours that are non-reflective and in dark matte colours such as dark grey or charcoal; and
- Information on the project should be provided to local people, such as through a poster at the entrance to the site.

**d) Cumulative impacts**

The visual impact of this proposed development was assessed in the context of the other renewable energy projects within the Copperton area that are in various stages of approval.

The local landscape may change in character from one which is agricultural and remote to one where there are isolated hi-tech developments, i.e. wind turbines and solar installations. The most visually significant developments, the wind energy facilities, are far apart from each other, excluding the proposed Mainstream Renewable Energy facility that is located close to this site. The solar installations would also be extensive but the scale of the landscape is sufficient to provide a setting for these developments as they are widely spaced and the area already has an industrial component. The local landscape character would be changed and made more industrial. The cumulative impact is assessed as medium (-) significance.

### *4.3.2 Impact on energy production*

South Africa has experienced a shortfall in electricity supply in the past few years and continues to experience constrained electricity supply. The proposed project could impact on the ability of Eskom to provide electricity.

**a) Description of the environment**

Historical trends in electricity demand in South Africa have shown a consistent increase in demand. There are some years where the demand levels off or decreases but over the long term there is still an increase. Such a decrease in demand was seen in 2009 in line with the global recession, demand growth has since resumed. As a result, the reserve margin still remains low and Eskom is still short of capacity, a situation that is expected to continue until new base load capacity can be brought online from 2012 onwards. The reserve margin will again be constrained after 2018 should no new base load power stations be constructed. The proposed wind energy facility would be able to provide power to assist in meeting the energy demand within South Africa.

In Eskom's Medium Term Adequacy Report (Week 44 of 2011) it is anticipated that the reserve margin would vary between 6.8 % (2013) and 12.7 % (2011) of Eskom's capacity and it would be necessary to import 1 500 MW of electricity annually up until 2014[31].

As noted in **Section 1.2.6.d** of this report, South Africa aims to procure 3 725 MW capacity of renewable energy by 2016 (the first round of procurement). The proposed project could provide 100 MW, or 2.7 %, of this figure.

**b) Impact assessment**

Given the need for increased production capacity in South Africa, as well as the targeted renewable energy figure, the potential impact of the proposed project on energy production is considered to be of low magnitude, regional and long term and therefore of **low (+)** significance, without or with mitigation measures.

No difference in significance would result from the proposed alternatives.

**c) Mitigation measures**

No mitigation measures are recommended.

**d) Cumulative impacts**

As shown in **Figure 4.7** below five other renewable energy projects are proposed for the area, with a combined capacity of 900-950 MW. The potential cumulative impact of this proposed project on South Africa's energy production would remain of **low (+)** significance.

### *4.3.3 Impact on climate change*

The establishment of a PV plant would reduce South Africa's future reliance on energy from coal-fired power stations which could in turn reduce the future volume of greenhouse gases emitted to the atmosphere, reducing the greenhouse effect on a regional, national and international scale.

**a) Description of the environment**

Gases which contribute to the greenhouse effect are known to include carbon dioxide ($CO_2$), methane ($CH_4$), water vapour, nitrous oxide, chloroflurocarbons (CFCs), halons and peroxyacylnitrate (PAN). All of these gases are transparent to shortwave radiation reaching the earth's surface, but trap long-wave radiation leaving the earth's surface, acting like a greenhouse. This action leads to a warming of the earth's lower atmosphere, with changes in the global and regional climates, rising sea levels and extended desertification. This is turn is expected to have severe ecological consequences and a suite of implications for

[31] http://www.eskom.co.za/c/article/803/adequacy-report-week-44/ (accessed 15/11/11)

humans. Total greenhouse gas emissions reported to be emitted within South Africa for the 2008 year was approximately 435 million metric tons of $CO_2$ equivalent (UN Statistical division, 2011).

**b) Impact assessment**

Greenhouse gases released from a new coal-fired power station are primarily $CO_2$ with minor amounts of nitrous oxide ($N_2O$). The Medupi Power Station (4 788 MW), currently under construction near Lephalale in Limpopo, is expected to produce 29.9 million metric tons of $CO_2$ per annum. The emissions from Medupi Power Station would increase South Africa's $CO_2$ equivalent emissions (2008) by some 7 %. This is a significant increase in greenhouse gas emissions, given the aims of the Kyoto Protocol, which are to reduce overall emission levels of the six major greenhouse gases to 5 % below the 1990 levels, between 2008 and 2012 in developed countries. While South Africa, as a developing country, is not obliged to make such reductions, the increase in greenhouse gas emissions must be viewed in light of global trends to reduce these emissions significantly.

No greenhouse gases are produced by PV plants during operation, as PV plants use solar energy that generate the electricity. Although PV plants would not completely replace coal-fired power stations within South Africa, since these would still be required to provide base-load, they would reduce South Africa's reliance on them. This would assist in reducing future volumes of greenhouse gas emissions.

A life-cycle analysis looks at the entire chain of activities needed for electricity production and distribution, such as fuel extraction and transport, processing and transformation, construction and installation of the plant and equipment, waste disposal, as well as the eventual decommissioning. Every energy technology (solar, wind, hydro, coal, gas, etc.) has its own very distinct fuel cycle. A comparative life-cycle analysis for the current energy technologies used in Europe was conducted by AUMA (2000). The study focused mainly on emissions from the various energy technologies. Although the results of the analysis are not necessarily entirely accurate in the South African context, they offer a good proxy for a comparative assessment of coal-fired and wind energy facilities in South Africa. The results of the analysis are illustrated graphically in **Figure 4.6** below.

It is evident from **Figure 4.6** above that environmental impacts associated with renewables, as opposed to fossil fuels such as coal, are significantly less over the entire life-cycle.

While the proposed PV plant would not provide an equivalent amount of energy to a typical new coal-fired power station (100 MW compared to 4 788 MW), when considered with regards to climate change and given the spirit of the Kyoto Protocol, the impact is deemed to be of regional extent, very low magnitude and long term and therefore of **low (+)** significance, without mitigation.


**Figure 4.6: Matrix of environmental impacts by categories (AUMA, 2000)**

### c) Mitigation measures

No mitigation measures are recommended.

### d) Cumulative impacts

As shown in **Figure 4.7**, five other renewable energy projects are proposed for the area, with a combined capacity of 900-950 MW. Furthermore, many more PV plants are proposed throughout South Africa. Given the number of PV plants proposed across the country, the potential reduction in future greenhouse gas emissions is considered to be of regional extent, low magnitude and long term, and therefore of *medium (+)* significance.

### *4.3.4 Impact on local economy (employment) and social conditions*

The establishment of the proposed PV energy facility would provide a number of direct, indirect and induced jobs. Direct jobs are created during manufacturing, construction and installation, operation and maintenance. The proposed project would also result in a large amount of expenditure in South Africa, both to procure services (e.g. transportation services) and materials (e.g. road building materials).

**a) Description of the environment**

Copperton falls within the Siyathemba Local Municipality (LM). The population of Siyathemba LM is 19 360 and this is split into 74 % Coloured, 14 % African, 11 % White and 1 % Other. The total number of households is 4 542. The main employment industry is farming, followed by mining. Agricultural activities extend to sheep, wheat, maize, lucerne, cotton, beans, vineyards and peanuts. There are 12 schools in the LM and, four clinics (one of which is in Prieska) and one hospital[32].

The site is located in a rural area and as such the population density is very low, with neighbours located kilometres away. Whilst Copperton itself was once a populated town, providing accommodation for the mine workers, this is no longer the case and the majority of houses have been demolished. A few houses are however still rented to retired farmers. According to the Pixley ka Seme DM SDF (2007) the 2001 population of Copperton (which fell under the DM's management, prior to being assimilated into the Siyathemba LM) was 37, with nine households. Employment opportunities in the immediate area stem from farming, the local accommodation lodge, Ietznietz, and Alkantpan weapons testing facility.

**b) Impact assessment**

Up to 100 operation and maintenance jobs would be created during the operational phase. Indirect and induced jobs would also result from the proposed project. It is important to note that the number of jobs does not equate to the number of people employed.

The operating expenditure of the proposed project would be roughly R 30 million per year, of which up to R 15 million per year would be spent in South Africa. Increased spending (procurement of goods and services) in South Africa would indirectly result in more employment opportunities. Increased employment opportunities (direct and indirect) would allow for an improvement in social conditions for those who obtain employment. The project would also result in an increase in the revenue of the LM through increased rates and taxes. This in turn could result in an increase in municipal spending on social programmes.

Based on the number of employment opportunities during the operational phase the potential impact on the local economy (employment) and social conditions is considered to

[32] Taken from http://www.siyathemba.co.za/demographics.htm (accessed 02/01/11)

be medium magnitude, regional and long term and therefore of **medium (+)** significance, with or without mitigation.

No difference in significance would result from the proposed alternatives.

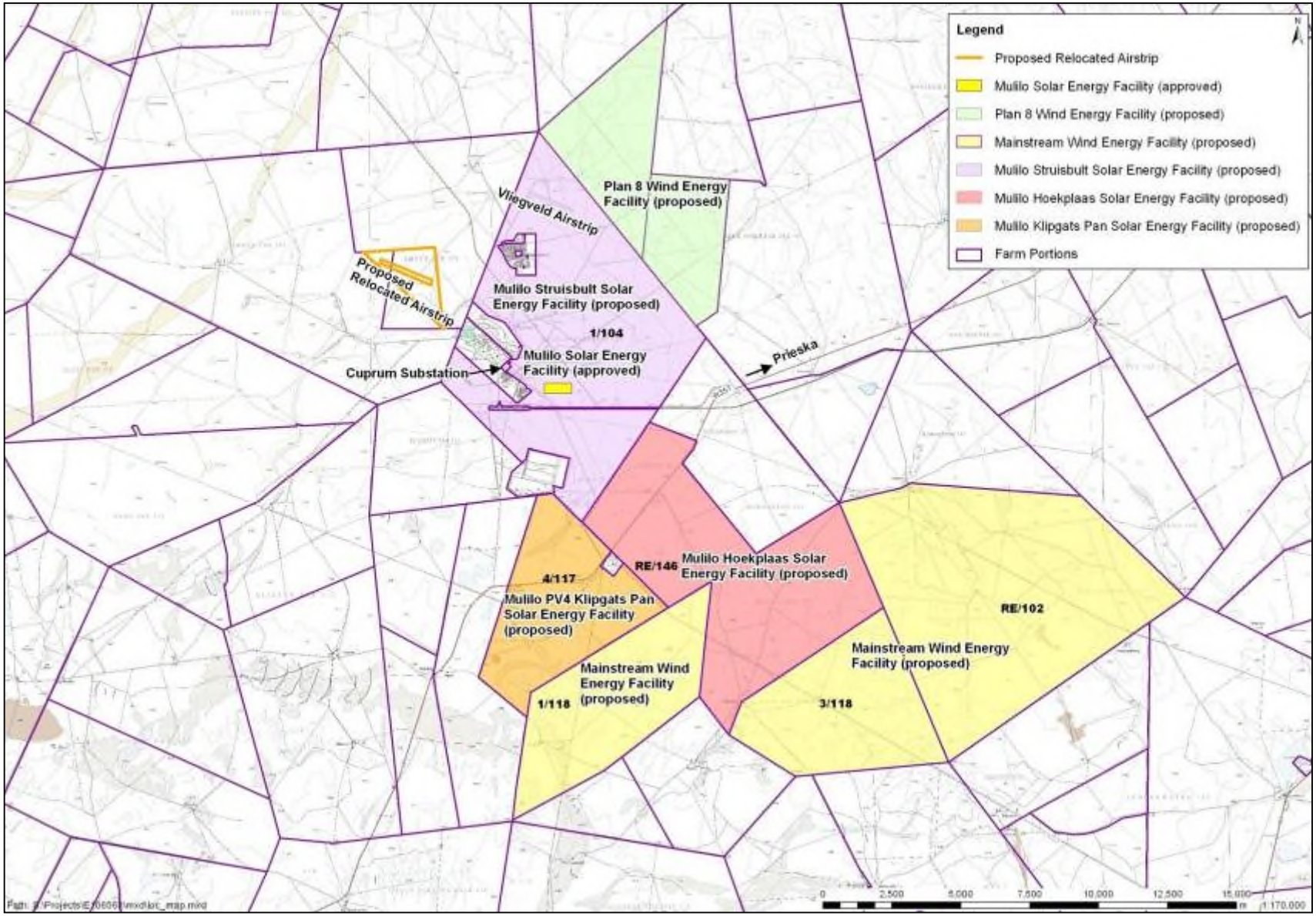



**Figure 4.7** Proposed energy developments in the area surrounding Copperton

**c) Mitigation measures**

The following mitigation measures are recommended:

- Give preference to local communities for employment opportunities; and
- Base recruitment on sound labour practices and with gender equality in mind.

**d) Cumulative impacts**

As noted previously, five other renewable energy projects are proposed for the area, with a combined capacity of 900-950 MW. The potential cumulative impact of these proposed projects on employment and socio-economic conditions in the local area would remain of **medium (+)** significance.

### *4.3.5 Impact on agricultural land*

The proposed site (Klipgats Pan Farm) is used as grazing land for livestock. The farm is split into two portions by the R357. The proposed solar energy facility (preferred and alternative) would have a footprint of 300 ha. Both the preferred and alternative sites are located south of the R357. For both sites the footprint of the proposed facility would reduce the area available for agriculture. As such Mr Kurt Barichievy of SiVEST (Pty) Ltd was appointed to undertake a desktop Agricultural Impact Assessment. A brief site visit was conducted on 5 and 6 December 2011. The study considered climate, geology, soils, terrain, land capability, current agricultural practices and agricultural potential. The desktop Agricultural Assessment and comment on the revised layout and technology alternatives for Klipgats Pan farm is included in **Annexure C**. The findings and recommendations of the study are summarised below.

**a) Description of the environment**

For the purpose of this study, agricultural potential is described as an area's suitability and capacity to sustainably accommodate an agricultural land use of the area. In most cases the agricultural potential is benchmarked against crop production.

*Climate*

Copperton area has an arid continental climate with a summer rainfall regime. The region typically experiences hot days and cold nights with the average summer temperature of approximately 33 ºC and the average winter night time temperatures of approximately 1 ºC. Most of the rainfall is confined to summer and early autumn. According to the Daily Rainfall Extraction Utility (Lynch, 2003) the MAP for the Copperton area is approximately 176 mm per year with 62 % of rainfall occurring between January and April. Considering that 500 mm is the minimum amount of rain required for sustainable dry land farming, the MAP of 176 mm is extremely low. Therefore without some form of supplementary irrigation, natural rainfall for the Copperton area is insufficient to produce sustainable harvests. This is reflected in the lack of dry land crop production within the area.

*Geology*

Both the proposed layouts (preferred and alternative) are underlain by tillite. Tillite consists of consolidated masses of unweathered blocks and unsorted glacial till. The proposed solar energy facility would completely be underlain by tillite.

*Slope*

The average gradient is less than 10 %, making this area ideal for intensive agriculture, with high potential for large scale mechanisation. The topography is thus not a limiting factor for agriculture.

*Land use*

The Klipgats Pan Farm consists of a mix of natural veld and vacant land which is used as general grazing land for livestock. Vast un-improved grazing land is interspersed by non-perennial stream beds. Stocking rates for the region are estimated at 1 small animal unit per 6 ha and 1 large animal unit per 35 ha. According to the land use data there are no signs of formal agricultural fields or cultivation on Klipgats Pan Farm.

*Soils*

The Environmental Potential Atlas for South Africa (ENPAT) for the Northern Cape Province shows the majority of Klipgats Pan Farm is dominated by a mix of both red and yellow apedal soil types. Apedal soils are weakly structured, tend to be freely drained and due to overriding climate conditions these soils will tend to be Eutropohic (high base status).The study area is classified as having an effective soil depth[33] of less than 0.45 m deep and therefore it is a limiting factor in terms of sustainable crop production. According to the Agricultural Geo-Referenced Information System (AGIS) the soils on Klipgats Pan Farm are associated with saline soils with a low water holding capacity, high pH and low organic matter content.

*Agricultural potential*

Restrictive climate characteristics, due to the strong summer rainfall regime, moisture stress and low winter temperatures reduce the agricultural potential of Farm Klipgats Pan. The ENPAT Database provides an overview of the study area's agricultural potential based on its soil characteristics although it does not take prevailing climate into account. The database indicated the study area is dominated by soils which are not suited for arable agriculture, but which can still be used as grazing land.

By taking all the site characteristics (climate, geology, land use, slope and soils) into account, the agricultural potential for the majority of the study area is classified as being extremely low for crop production, while moderate to moderately low for grazing. This poor agricultural potential rating is primarily due to restrictive climatic characteristics and soil depth limitations. The site is not classified as high potential, nor is it a unique dry land agricultural resource.

[33] Depth to which roots can penetrate the soil (SiVEST, 2012)

### b) Impact assessment

The footprint of the proposed project would result in the loss of 300 ha (preferred and alternative layouts) on the Farm Klipgats Pan. There are no centre pivots, irrigation schemes or active agricultural fields which will be influenced by the proposed development. The farm can be classified as having extremely low agricultural potential for crop production, while moderate to moderately low potential for grazing. The proposed project would only influence a portion of Farm Klipgats Pan and the remaining land would continue to function as it did prior to the proposed solar energy facility. Consequently, the overall impact on agricultural potential and production is considered to be of very low intensity, local extent and long term and therefore of **very low (-)** significance with and without mitigation, for both alternative layouts, due to the site's low inherent agricultural potential.

It was noted in the specialist study that a full agricultural assessment was not considered to be necessary.

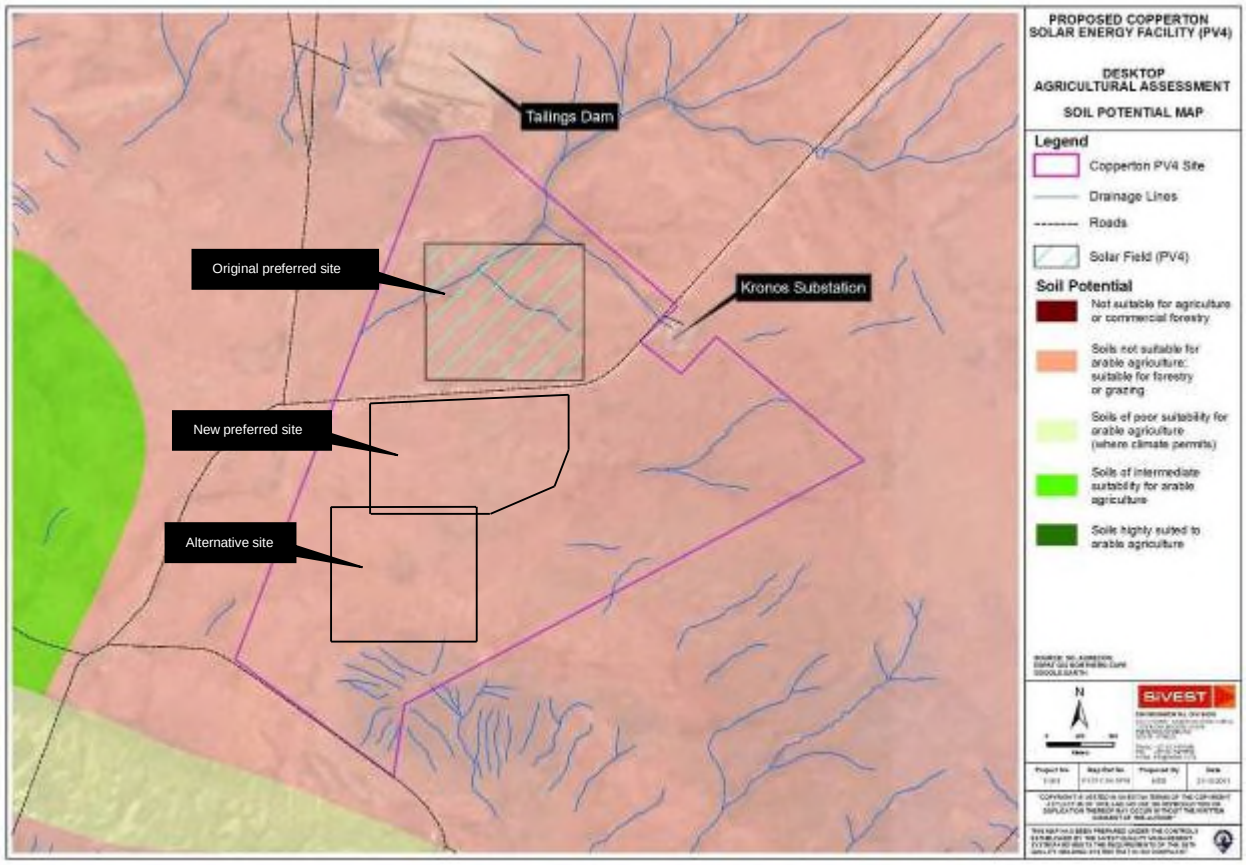



**Figure 4.8: Soil Potential Map**

### c) Mitigation measures

No specific mitigation measures are recommended.

**d) Cumulative impacts**

The reduction in usable grazing owing to various solar projects (one approved and three, including this proposal, proposed) planned in and around Copperton could place increased pressure on adjacent land. However, due to the limited agricultural potential described above and on the other sites, the potential impact of this increased pressure is considered to be of very low (-) significance.

### *4.3.6 Impact on surrounding land uses*

The predominant surrounding landuse is agriculture. However a few other land uses exist and the proposed project could impact on these surrounding land uses.

**a) Description of the environmental**

At the abandoned Copperton mine a PV power generation facility is proposed by Mulilo that recently received an Environmental Authorisation (DEA Ref. No. 12/12/20/1722). Further west of the site is Alkantpan, a weapons testing range, used by many countries for weapons testing. Other proposed activities in the area include a wind energy facility to the east proposed by Plan 8 (Pty) Ltd (DEA Ref. No. 12/12/20/2099), two PV plants to the west and north of the site on farms Hoekplaas (DEA Ref. No. 12/12/20/2503) and Struisbult (DEA Ref. No.12/12/20/2502) and wind and solar energy facilities proposed by Mainstream Renewable Energy (Pty) Ltd (DEA Ref. No. 12/12/20/2320/1 and 12/12/20/2320/2) of which the one site (Farm 118/1) borders directly to Klipgats Pan and the remaining two sites are approximately 5 km (Farm 118/3) and 8 km (Farm 102/RE) to the south.

Furthermore, a 1.7 km airstrip is located to the west of the site and is used by a number of aeroclubs (e.g. Aeroclub SA). The airstrip would however need to be relocated to Alkantpan should the wind energy facility (by Plan 8 (Pty) Ltd (DEA Ref. No. 12/12/20/2099)) receive approval. The current world record for paragliding (502 km) was set from Copperton. Copperton produces good thermal activity with minimal low level obstructions to facilitate safe launching and departures for paragliders and light aircraft.

Copperton town, consisting of a few dwellings and a small shop is also located immediately west of the site.

As noted in **Section 1.2.3** the proposed PV generation facility site falls within the general astronomy advantage area and is located approximately 13 km north of a SKA station (see **Figure 4.9** below). The Karoo Core Astronomy Advantage Area will contain the MeerKAT radio telescope and the proposed core planned SKA radio telescope that would be used for the purposes of radio astronomy and related scientific endeavours. South Africa, along with Australia, has been shortlisted to host the world's largest telescope, the SKA. South Africa's bid proposes that the core of the telescope be located in an arid area of the Northern Cape, with approximately four antenna stations in Namibia, three in Botswana, two in each of

Mozambique and Madagascar, and one each in Mauritius, Kenya, Ghana and Zambia[34]. A final decision on the location is expected to be made in early 2012 by the SKA Board of Directors.

**b) Impact assessment**

Based on the distance to the nearest SKA station the proposed development could potentially impact on the SKA project. There are two major mechanisms that would result in detrimental effects on radio astronomy observations by PV facilities. The first effect is as a result of the electromagnetic interference generated from the power generation equipment. This is broadband interference, and would result in a complete shutdown of radio astronomy observations. Mulilo has however investigated radio frequency interference (RFI) shielding of the primary switchgear and insulated gate bipolar transistor (IGBT) components. Based on Mulilo's previous experience with RFI shielding, it is believed that a suitable system can be incorporated into the design and the South African SKA Project Office (SASPO) is invited to assist with this design at the appropriate time.

Without an accurate electromagnetic characterisation of the equipment being used, it would be difficult to determine a separation distance that would be required to ensure radio astronomy receivers are protected. Electromagnetic characterisation of the components can be accessed once detailed design is complete. However, SASPO has indicated that experience from other equipment that meets the various SANS standards in South Africa indicates that at least a 10 km separation distance would be required for equipment at ground level. Based on this fact, Mulilo has selected the current locations of the sites and performed a view shed analysis (refer to **Figure 4.9**) on them to ensure no line of site impacts were evident. Furthermore, the SKA station is located approximately 13 km away from the proposed PV plant.

[34] http://www.ska.ac.za/bid/index.php (accessed 19/10/11)

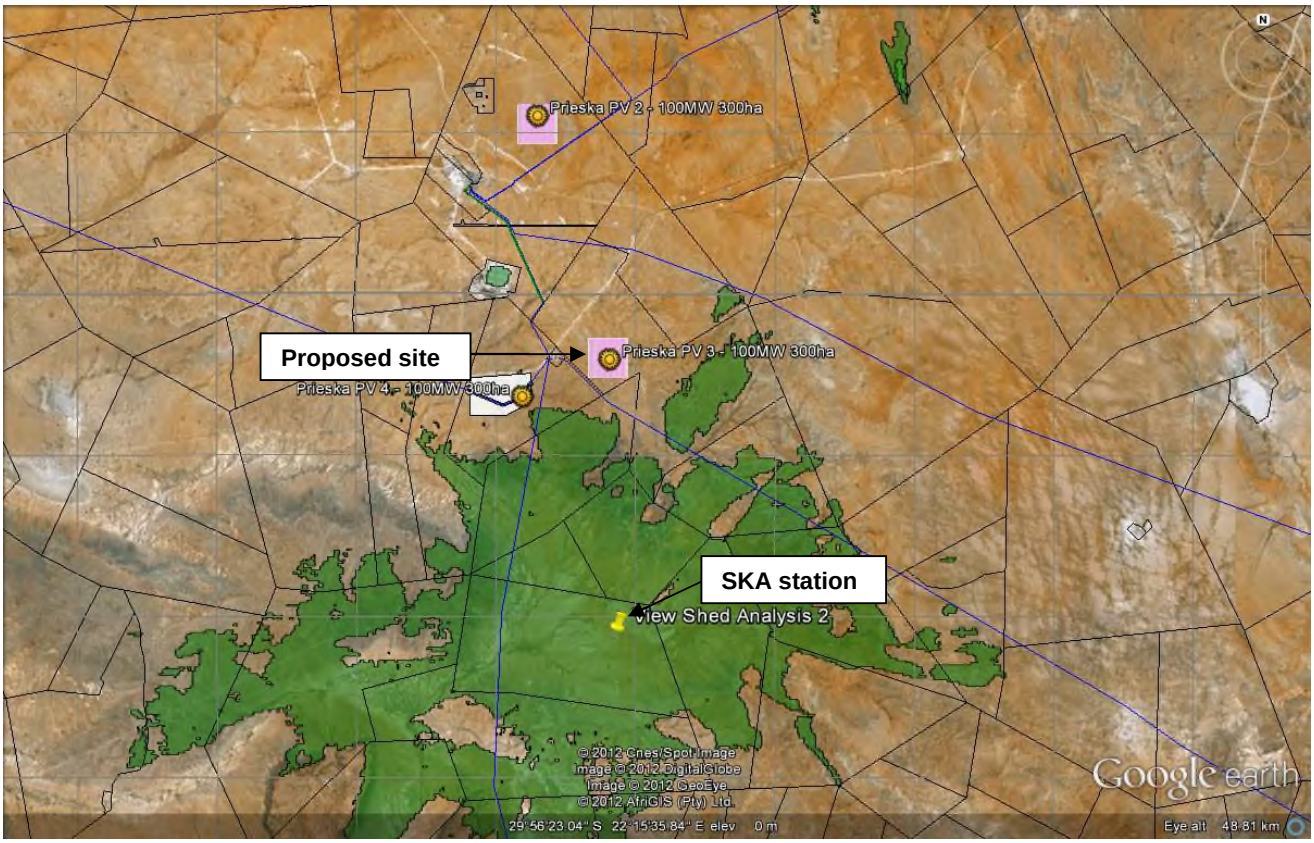



**Figure 4.9: Results from a view shed analysis (areas indicated in green) undertaken by Mulilo to identify potential impacts on the nearest SKA station (courtesy Mulilo)**

At heights greater than 50 m above ground, this separation distance would increase significantly due to the lack of potential topographical shielding. The second, and probably more significant mechanism, is that of the PV facility acting as secondary transmitters. That is, the solar panels would reflect distant radio signals from other transmitters onto the radio telescopes. This would result in detrimental effects to the radio astronomy facility. International practice suggests that energy facilities should not be in line-of site of any radio telescope receiver. This is not applicable to the conventional PV alternative, as the solar panels would be approximately 4 m in height (see **Figure 4. 9**). However, in the case of the 14.5 m CPVs the proposed project is likely to be within the line of sight of the SKA station.

Based on the information available should the PV generation facility interfere with the SKA satellite station the potential impact is considered to be of low magnitude, regional extent and long term and therefore of **low (-)** significance, without mitigation for all alternatives. Note that the confidence in this impact is considered to be Unsure[35]. No difference in significance would result from the proposed alternatives. The confidence level of this impact would change once a detailed impact analysis is undertaken together with the SASPO.

[35] Limited useful information on and understanding of the environmental factors potentially influencing this impact is available.

As mitigation measures have not yet been determined it is not possible to ascertain the significance of the potential impact after mitigation at this point. However, it is anticipated that mitigation measures would be sufficient to reduce the significance of the potential impact to a level acceptable to SASPO, failing which the proposed project would not be allowed to proceed. The significance of the potential impact would only be determined after the detailed impact analysis is complete.

It should be noted that should the SKA project be awarded to Australia no impact would result from the proposed wind energy facility. This decision is due to be taken early in 2012 by the SKA Board of Directors.

**c) Mitigation measures**

It is anticipated that mitigation measures would be identified after the detailed impact analysis has taken place.

**d) Cumulative impacts**

It is anticipated that the potential impact on SKA would be reduced to a level acceptable to SASPO. Furthermore, it is expected that any other PV energy facilities would need to reduce their potential impact (including cumulative impact) to a level acceptable to SASPO.

## 4.4 CONSTRUCTION PHASE IMPACTS ON THE BIOPHYSICAL AND SOCIAL ENVIRONMENTS

The construction phase is likely to result in a number of negative impacts on the biophysical and the social environment. These could potentially include:

- Disturbance of flora, avifauna and fauna;
- Sedimentation and erosion of water ways;
- Impact on heritage (including palaeontology) resources;
- Impact on local economy (employment) and social conditions;
- Impact on traffic;
- Visual impacts;
- Storage of hazardous substances on site;
- Noise pollution; and
- Dust impact.

The significance of construction phase impacts is likely to be limited by their relatively short duration, since the construction phase should last approximately 18 to 30 months. Many of the construction phase impacts could be mitigated through the implementation of an appropriate EMP. A life-cycle EMP is contained in **Annexure D** of this report, which specifies the mitigation measures that could be implemented to mitigate construction phase impacts, amongst others.

### *4.4.1 Disturbance of flora, avifauna, and fauna*

*Flora*
It is anticipated that there would be loss of vegetation and ecological processes during the construction phase of the facility for both the preferred alternative and the alternative.

*Avifauna*
Given the considerable space requirements of commercially viable facilities (300 ha for this proposed project) the construction phase would result in temporary damage or permanent destruction of habitat larger than this area. This could have a lasting impact in cases where the site coincides with critical areas for restricted range, endemic and/or threatened species. The effect could be significant in some instances, allowing for the possible cumulative effects of multiple facilities in one area. Furthermore, construction activities could disturb breeding, foraging or migrating birds. Bird species of particular concern, which may be affected, include Red Lark and Sclater's Lark, Martial Eagle, Lanner Falcon, Ludwig's Bustard and possibly flamingo.

*Fauna*
Any affected fauna would generally be largely mobile and would relocate during the construction phase and are likely to recolonise the area, once the construction phase has been completed and the disturbed areas rehabilitated.

Based on the above the potential impact on flora, birds and fauna during construction due to disturbance, habit loss and displacement is considered to be of low to medium magnitude, local extent and short term and therefore **low (-)** significance without mitigation. With the implementation of mitigation measures this is anticipated to reduce to **very low (-)** significance. There would be no difference in significance as a result of the proposed alternatives.

The following mitigation measures are recommended:

- In all cases construction of access roads should be designed for minimal impact. All construction should take place within the footprint of the proposed PV plant;
- A rehabilitation plan for the site should be compiled with the aid of a rehabilitation specialist and adhered to;
- Compile and implement a vegetation rehabilitation plan with the aid of a rehabilitation specialist, for inclusion in the Construction EMP. The specialist is to recommend species to be used in rehabilitation as well as any special measures for rehabilitation such as shade-netting and alien vegetation removal;
- The construction phase should be closely monitored by an Environmental Control Officer who should identify any areas that would require rehabilitation in the post-construction phase. The restoration of those areas must follow the construction phase;
- Demarcate no-go areas identified during pre-construction monitoring;
- Low-lying depressions and watercourses should be avoided wherever possible;

- Shallow depressions and well defined pans should be avoided and buffered by at least 30 m; and
- The site should be cleared in sections as required for construction and not all at once.

### *4.4.2 Sedimentation, erosion and aquatic ecology*

The sediment loads of any drainage depressions or pans may increase due to the excavations on the site, the laying of linear infrastructure such as roads across drainage lines and other construction related activities. This would be exacerbated during the wet season and during any intense rainfall events. Other potential impacts include the formation of barriers to drainage areas, increased invasion by alien plant species, especially perennial aggressive species such as *P. glandulosa* and the production and handling of wastewater.

The following mitigation measures are recommended:

- The proposed project should be located away from the no-go areas, including a 30 m buffer area around these no-go areas;
- Access roads should be positioned in such a way that no clearing within no-go areas is required and definite drainage areas should be avoided;
- Should additional access roads be required, these should be limited to one crossing point and built with culverts to prevent the impediment of water movement;
- The use of erosion control measures to minimise erosion at excavation / clearing sites or aggregate storage sites;
- Earth moving construction activities should take place in the dry season as far as possible; and
- Remove perennial alien species such as *P. glandulosa* at sites disturbed or cleared by construction activities.

### *4.4.3 Impact on heritage resources*

As a result of the relatively undisturbed nature of the site, and the findings of the archaeology study on an adjacent property, it is likely that archaeological or cultural material would be found on site. Furthermore, due to the underlying geology of the Main Karoo Basin underlain by sedimentary rocks of the Karoo Supergroup, there is a possibility of finding palaeontological material. A large scale development such as the proposed project could have a negative impact on the archaeological and cultural heritage resources (including visual, landscape and sense of place impacts) by damaging or destroying such material or by requiring the material to be removed and stored *in situ*. A Heritage Impact Assessment (HIA) was conducted by Jayson Orton of the Archaeology Contracts Office (ACO) to assess the impacts of the solar energy facility on the heritage resources in the project area. Information for the study was sourced from published and unpublished archaeological reports, as well as a physical survey by the specialists of the project area on 10 to 13 December 2011. The HIA and comment on the revised layout and technology alternatives are included in **Annexure C**.

A Palaeontology Impact Assessment (PIA) was also undertaken by Dr John Almond and included a desktop review and field-based assessment on 26 January 2012. The PIA and comment on the revised layout and technology alternatives are included in **Annexure C**. The findings and recommendations of the studies are summarised below.

**a) Description of the environment**

In general the Karoo and Bushmanland area is documented to contain abundant stone artefacts from the Early (ESA) and Middle Stone Age (MSA), while occasional Later Stone Age (LSA) artefacts are also present. These artefacts are generally very well weathered in the form of background scatter. Excavations at Bundu Pan, 25-30 km northwest of Copperton, uncovered archaeological material regarded to be generally rare in South Africa and included findings of preserved Pleistocene faunal material, bones of wildebeest, warthog, extinct giant hartebeest, species of equid (horse/zebra), baboon, springbok and blesbok. Rock art in the form of engravings dating back to the period when indigenous people or Bushman lived in the area are widely known in the area. More recent heritage includes typical flat-roofed Karoo-style houses commonly found in the small towns and war graves and a British fort at Prieska dating from the Anglo-Boer War.

**Figure 4.10** shows the distribution of archaeological resources recorded during the survey. Three large clusters of LSA occupation material were found atop the elevated terrace at the far north end of the study area, in the southern area on elevated ground overlooking the pan to the west and at the ephemeral pans, just north of the R357. Most examples of MSA and ESA material were in the form of background scatter and included heavily weathered stone material such as hand-axes (see **Figure 4.11**). LSA material includes stone implements of quartzite, ostrich eggshell and bone fragments.

A number of ruined structures and artefact scatters were found. The ruined structures include a pillar, stone walls and structures associated with a historical farm house complex. Scatters of glass, ceramic and stone artefacts dating from the late 19$^{th}$ or early 20$^{th}$ century was also found around the farm complex and examples of these are depicted in **Figure 4.12**.

A windmill, watering/feeding troughs and a stone-lined dam comprise the cultural landscape. Two shale quarries located on the hill were used for sourcing the stone for construction of the farm buildings and are also of significance.

The R357 connecting Prieska and Vanwyksvlei via Copperton, is a generally scenic route and contributes to the sense of place created by typical undeveloped Karoo open space.

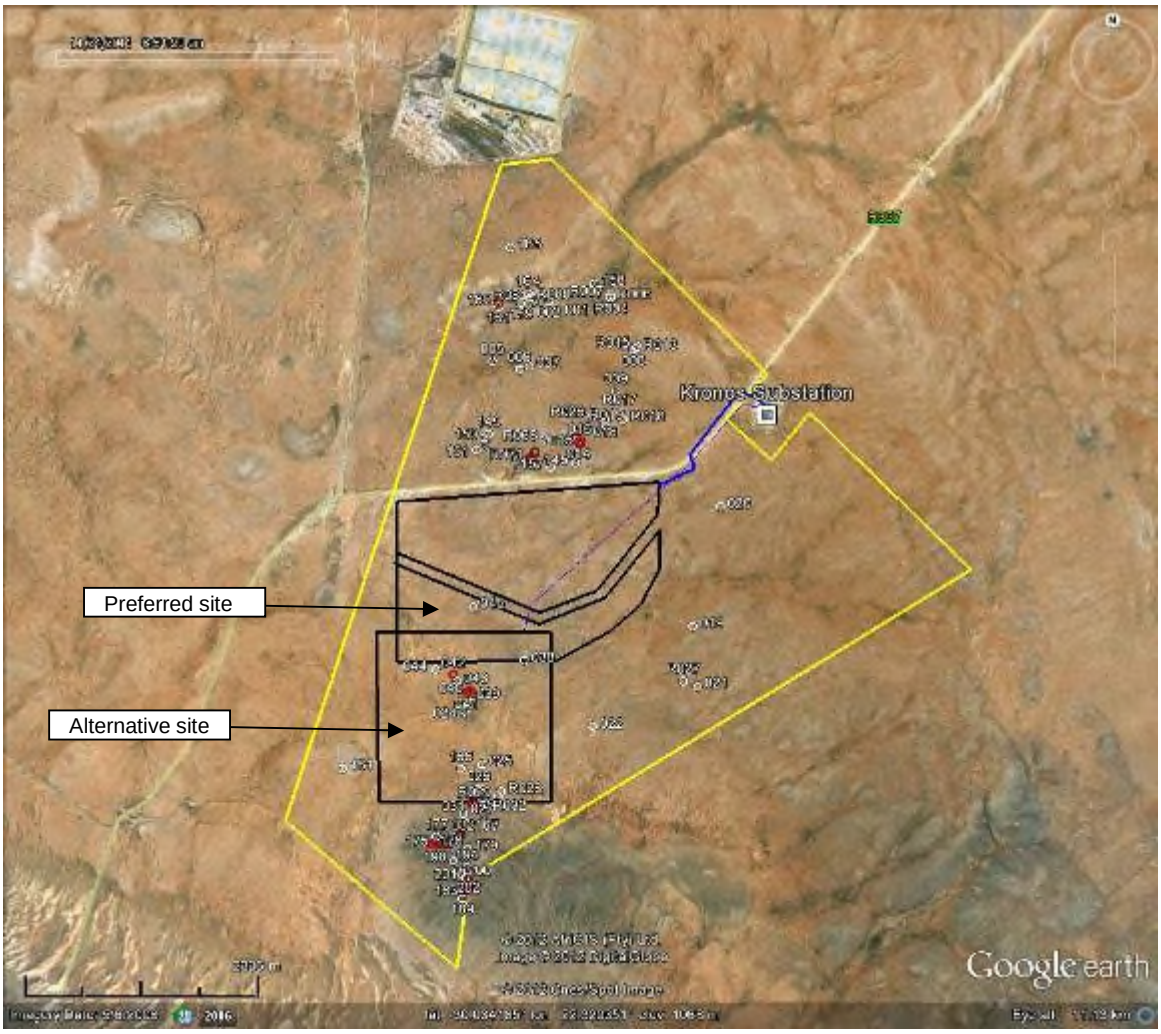



**Figure 4.10: Aerial view of the study area taken from Google Earth and showing the distribution of recorded archaeological occurrences by their field numbers. Sites red symbols require mitigation, whereas the white ones do not (ACO, 2012)**

**Figure 4.11: Selection of isolated artefacts from the background scatter on Klipgats Pan showing the variability in materials and weathering states (ACO, 13/12/2011)**

**Figure 4.12: Glass and ceramics artefacts (ACO, 13/12/2011)**

The geology of the study area consists of Permo-Carboniferous glacial sediments of the Dwyka Group (Karoo Supergroup) that overlie granitoid Precambrian basement rocks of the Namaqua-Natal Metamorphic Province and are locally intruded by Karoo dolerites and narrow kimberlite dykes of Cretaceous age. These older bedrocks are widely covered by a range of superficial deposits of Pleistocene to Recent age, including alluvium, down wasted coarse gravels, calcrete hardpans, and sandy to silty soils and pan sediments.

The main geological units mapped within the study region are indicated in **Figure 4.13**. The field visit on Klipgats Pan found that the poorly-exposed upper Dwyka Group bedrocks in the study area do not contain rich trace fossil assemblages, petrified wood or other fossil material. The only fossils recorded from the Dwyka succession here are ice-transported erratic boulders of Precambrian limestone or dolomite that contain small stromatolites (microbial mounds or columns) (see **Figure 4.14**). These boulders most likely originate from the Precambrian Campbell Rand Subgroup of the Ghaap Plateau. The overlying superficial sediments are of low palaeontological sensitivity for the most part.

No fossil remains were observed within the superficial sediments on Klipgats Pan. It is quite likely that fossil bones and teeth of mammals are preserved within buried Pleistocene fluvial and pan sediments as recorded on the adjacent farm Hoekplaas.

Karoo bedrocks on site are deeply weathered and at most sparsely fossiliferous and significant fossil material (e.g. mammal remains) at or near surface is probably very sparsely distributed in the study area.

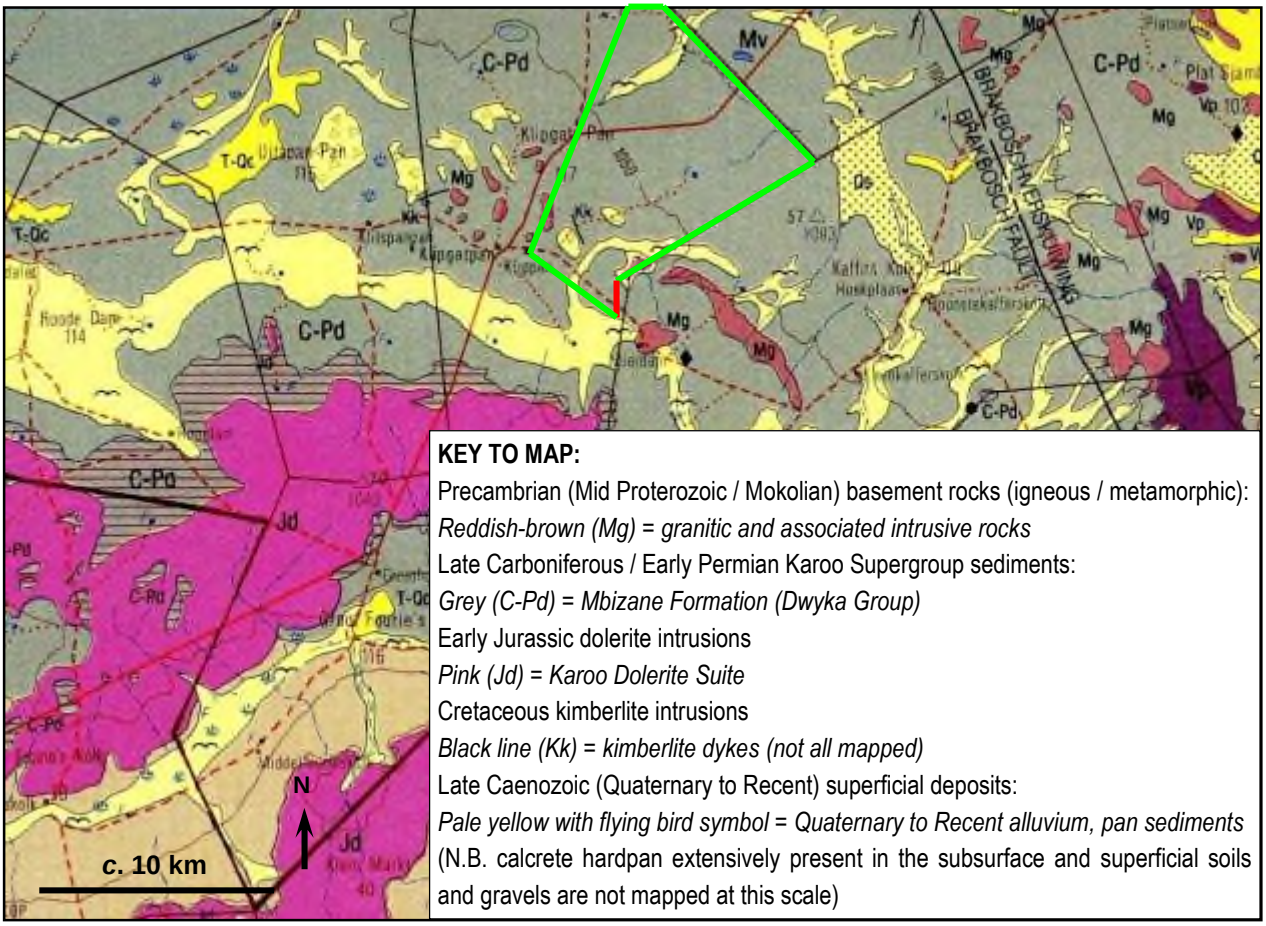



**Figure 4.13: Extract from 1: 250 000 geology map 3022 Britstown showing approximate outline of the proposed solar energy facility near Copperton (green polygon) (J. Almond, 2012)**

**Figure 4.14: Small Dwyka erratic boulder of pale grey laminated carbonate (probably dolomite) showing small stromatolitic domes or columns (J. Almond, 26/01/2012)**

**b) Impact assessment**

The construction and operation of solar energy facilities have the potential to produce a wide range of impacts that would affect the heritage qualities of an area. During the construction phase of the project, activities such as bulldozing of access roads to the site and excavation of cable trenches may result in the following impacts on the landscape and heritage environment:

- Displacement of pre-colonial and colonial archaeology material;
- Accidental damage and / or vandalism to the build environment, such as historical structures and ruins; and
- Negative visual impact of solar energy generation facilities on the cultural landscape, scenic quality and sense of place of the Karoo and Bushmanland.

Both sites would affect pre-historical and historical archaeology. Although most of the pre-historical archaeology present on site is background scatter of low significance, important LSA archaeological sites do occur. Relatively little is known of Bushmanland archaeology and loss of any significant LSA sites would be a considerable impact. The alternative site includes three built structures and some ruins forming an old farm complex which should be avoided. These structures are likely less than 100 years of age and not legally protected. No sites were identified in the preferred location that would require mitigation measures from an archaeological perspective.

The R357, although scenic, is little used aside from a few local farmers and is not considered an important scenic route which makes the visual impacts very low. Given the general topography, no mitigation is proposed for the visual impacts.

Based on the above considerations the potential impact on the archaeological resources by the preferred site is considered to be of low magnitude, site specific and long term duration and therefore of **low (-)** significance, without mitigation. No mitigation measures are required. The potential impact on archaeological resources, including the built environment, at the alternative site is considered to be of high magnitude, local extent and long term and thus of **high (-)** significance. Should the historical built environment be avoided, through mitigation, the impact would have **low (-)** significance.

With regards to potential impacts on palaeontological resources, the construction of the facility would involve excavations into the superficial sediment cover (soils, alluvial gravels etc.) and potentially also into the underlying potentially fossiliferous bedrock. These include excavations for the PV tracker support structures, buried cables, internal access roads and associated infrastructure. Potential fossil heritage within the study area may be destroyed, disturbed or permanently sealed in and would no longer be available for scientific research or other public good.

The footprints for both the preferred and alternative sites are small and largely underlain by superficial deposits of low paleontological sensitivity. Extensive, deep bedrock excavations are not envisaged during the construction phase. As such, the impact significance on fossil heritage is considered to be of low magnitude, local extent and long term and therefore of **low (-)** significance, without or with mitigation, for all alternatives.

**c) Mitigation measures**

The following mitigation measures are recommended:

- The complex LSA sites on the hill to the south, as well as the historical buildings on the alternative site should be demarcated as a no-go area during construction;
- Destruction of these structures would require a detailed survey and recording of the entire complex, as well as a permit from the relevant heritage authority;
- Archaeological sites (areas indicated with a red dot on **Figure 4.10**) should be mitigated by excavation and sampling of sites before the start of construction should they be threatened by construction activities; and
- In the event of accidental uncovering of graves or substantial fossil remains (e.g. vertebrate bones and teeth, large blocks of petrified wood), work must stop immediately and SAHRA should be notified. An archaeologist / palaeontologist should be involved to assist with the investigation and procedures to address the situation.

**d) Cumulative impacts**

Considering the scale of archaeological research in other parts of South Africa, relatively little is known of Bushmanland and the loss of any significant LSA sites would impact on knowledge of the wider region. With many energy generation facilities planned in the region, the potential to lose many sites exists. The historical archaeological sites on the site are not yet legally protected, while no significant pre-colonial resources occur. Cumulative impacts are not of concern in this regard.

Given the low overall paleontological sensitivity of the Karoo bedrocks and Pleistocene to Recent superficial sediments of the region as a whole, the cumulative palaeontological impact of this development is not considered to be of a significance higher than the individual impact (i.e. low (-)).

### *4.4.4 Impact on local economy (employment) and social conditions*

The project would generate between 70 and 100 jobs during the operational phase, which is expected to last the full period of the Power Purchase Agreement which is 20 years. The construction phase is expected to produce a maximum of 200 jobs (amounting to a total of 900 person months employment created over the construction period) depending on the procurement method used.

**a) Impact assessment**

Up to 100 operation and maintenance jobs would be created during the operational phase. Indirect and induced jobs would also result from the proposed project.

The operating expenditure of the proposed project would be roughly R 30 million, of which up to R 15 million would be spent in South Africa. Increased spending (procurement of goods and services) in South Africa would indirectly result in more employment opportunities.

Increased employment opportunities (direct and indirect) would allow for an improvement in social conditions for those who obtain employment. The project would also result in an increase in the revenue of the Local Municipality through increased rates and taxes. This in turn could result in an increase in municipal spending on social programmes.

Based on the number of employment opportunities during the operational phase the potential impact on the local economy (employment) and social conditions is considered to be low magnitude, regional and long term and therefore of ***low (positive)*** significance, with or without mitigation.

*No difference in significance would result from the proposed alternatives.*

**b) Mitigation measures**

The following mitigation measures are recommended:
- Give preference to local communities for employment opportunities; and
- Base recruitment on sound labour practices and with gender equality in mind.

### *4.4.5 Impact on traffic*

Construction vehicles are likely to make use of the existing roads to transport equipment and material to the construction site. These vehicles would include:
- 450 truckloads transporting 900 40-foot containers;
- Two to five digger loaders for land clearing; and
- Five to ten trucks with cranes to assemble the plant.

Transporting components to site is likely to necessitate the upgrading of sections of road to ensure clearances and bends are negotiable by trucks.

The potential impact of the project on transport is considered to be of low magnitude, regional extent and short term and therefore of **very low (-)** significance, with or without mitigation. The cumulative potential impact of energy projects on transport is considered to be of high magnitude, regional extent and short term and therefore of high (-) significance,

with or without mitigation due to the significance of transporting wind turbine components. No difference in impact significance would result from the proposed alternatives.

The following mitigation measures are recommended:

- Ensure that road junctions have good sightlines;
- Implement traffic control measures where necessary;
- Transport components overnight as far as possible; and
- Engage with the roads authorities prior to construction to ensure the necessary road upgrades, permits, traffic escorts etc. are scheduled.

### *4.4.6 Visual impact*

Construction activities would include upgrading the site accesses, constructing new site roads, excavating for foundations and installations of above ground infrastructure. These are expected to be most visible within 2 km, especially as the construction plant would be fitted with warning lights and sounds.

The potential construction phase visual impact is considered to be of medium intensity, site specific in extent and short term and therefore of **low (-)** significance, without mitigation. With the implementation of mitigation measures this would reduce to **very low to low (-)** significance. No difference in impact significance would result from the proposed alternatives.

The following mitigation measures are recommended:

- Minimise the construction period, where possible;
- Access road are to be kept tidy, and measures shall be taken to minimise dust from construction traffic on gravel roads;
- Topsoil should be removed, conserved and used for rehabilitation; and
- Site offices, if required, should be limited to single storey and they should be sited carefully using temporary screen fencing to screen from the wider landscape.

### *4.4.7 Storage of hazardous substances on site*

As at any construction site, various hazardous substances (less than 5 $m^3$) are likely to be used and stored on site. These substances may include amongst other things, diesel, curing compounds, shutter oil and cement. Utilisation of such substances in close proximity to aquatic environments such as pans is of greater concern than when used in a terrestrial environment.

Use of hazardous substances at a construction site is controlled by various pieces of legislation. The management and protection of the environment would however be achieved through the implementation of an EMP, which would *inter alia* specify the storage details of hazardous compounds and the emergency procedures to follow in the event of a spillage.

The potential impact of spillages is considered to be of low intensity, site specific in extent and long term and therefore of **low (-)** significance, without mitigation. With the implementation of mitigation measures this would reduce to **very low (-)** significance. No difference in impact significance would result from the proposed alternatives.

### *4.4.8 Noise pollution*

An increase in noise pollution would be expected from the operation of heavy machinery during the construction period, as well as due to the increased traffic. The severity of this impact is likely to be reduced due to the low numbers of people in close proximity to the site.

The potential impact of noise is considered to be of very low intensity, site specific in extent and short term and therefore of ***very low (-)*** significance, without or with mitigation. No difference in impact significance would result from the proposed alternatives.

### *4.4.9 Dust impacts*

Construction vehicles are likely to make use of the existing farm roads to transport equipment and material to the construction site. Earthworks would also be undertaken. These activities would exacerbate dust especially in the dry winter months. The dust impact would be managed through the EMP, which would include procedures for dealing with dust pollution events including watering of roads, etc.

The potential impact of dust is considered to be of low intensity, site specific in extent and short term and therefore of **very low (-)** significance, without and with mitigation. No difference in impact significance would result from the proposed alternatives.

## 4.5 SUMMARY OF POTENTIAL IMPACTS

A summary of all the potential impacts from the proposed project assessed above is included in **Table 4.2**. While some difference in magnitude of the potential impacts would result from the proposed alternatives this difference was not considered to be significant for any of the potential impacts. As such, the table below applies to all proposed alternatives.

***Table 4.2 Summary of potential impacts of the proposed project[36]***

| Potential impact | No mit/Mit[37] | Extent | Magnitude | Duration | SIGNIFICANCE | Probability | Conf.[38] | Reversibility |
|---|---|---|---|---|---|---|---|---|
| **OPERATIONAL PHASE** | | | | | | | | |
| Impact on botany: | No mit | Local | Low | Long term | **Low (-)** | Definite | Sure | Irreversible |
| | Mit | Local | Low | Long term | **Low (-)** | Probable | Sure | Irreversible |
| Impact on birds | No mit | Local | Medium - Low | Long term | **Medium - Low (-)** | Probable | Sure | Irreversible |
| | Mit | Local | Low | Long term | **Low (-)** | Probable | Sure | Irreversible |
| Impact on fauna | No mit | Local | Low | Short term | **Low (-)** | Probable | Low | Reversible |
| | Mit | Local | Low | Short term | **Low (-)** | Probable | Low | Reversible |
| Impact on surface water: Aquatic | No mit | Local | Medium | Short term | **Medium (-)** | Probable | Low | Reversible |
| | Mit | Local | Low | Short term | **Low (-)** | Probable | Low | Reversible |
| Stormwater | No mit | Local | Medium | Short term | **Medium (-)** | Probable | Low | Reversible |
| | Mit | Local | Low | Short term | **Very Low (-)** | Probable | Low | Reversible |
| Visual aesthetics | No mit | Regional | Medium - High | Long term | **Medium - High (-)** | Definite | Sure | Reversible |
| | Mit | Regional | Medium - Low | Long term | **Medium - Low (-)** | Definite | Sure | Reversible |
| Impact on energy production | No mit | Regional | Low | Long term | ***Low (+)*** | Probable | Sure | Reversible |
| | Mit | Regional | Low | Long term | ***Low (+)*** | Probable | Sure | Reversible |
| Impact on climate change | No mit | Regional | Very Low | Long Term | **Low (+)** | Probable | Sure | Reversible |
| | Mit | Regional | Very Low | Long Term | **Low (+)** | Probable | Sure | Reversible |
| Impact on local economy (employment) and social conditions | No mit | Regional | Medium | Long term | ***Medium (+)*** | Probable | Sure | Reversible |
| | Mit | Regional | Medium | Long term | ***Medium (+)*** | Probable | Sure | Reversible |
| Impact on agricultural land | No mit | Local | Very low | Long term | **Very low (-)** | Probable | Sure | Reversible |
| | Mit | Local | Very low | Long term | **Very low (-)** | Probable | Sure | Reversible |
| Impact on surrounding land uses | No mit | Regional | Low | Long term | **Low(-)** | Probable | Unsure | Reversible |

[36] While some difference in magnitude of the potential impacts would result from the proposed alternatives this difference was not considered to be significant for any of the potential impacts. As such, the table applies to all proposed alternatives.

[37] Note that this refers to No mitigation and Mitigation.

[38] Conf.=Confidence in the assessment of the potential impact.

| Potential impact | No mit/Mit[37] | Extent | Magnitude | Duration | SIGNIFICANCE | Probability | Conf.[38] | Reversibility |
|---|---|---|---|---|---|---|---|---|
| | Mit | | | | Undetermined | | | |
| **CONSTRUCTION PHASE** | | | | | | | | |
| Impacts on flora, avifauna and fauna | No mit | Local | Low | Medium term | **Low (-)** | Probable | Sure | Reversible |
| | Mit | Local | Very Low | Medium term | **Very Low (-)** | Probable | Sure | Reversible |
| Sedimentation, erosion and aquatic ecology | No mit | Local | Low | Short term | **Low (-)** | Probable | Sure | Reversible |
| | Mit | Local | Low | Short term | **Very Low (-)** | Probable | Sure | Reversible |
| Impact on traffic | No mit | Regional | Low | Short term | **Very Low (-)** | Probable | Sure | Reversible |
| | Mit | Regional | Low | Short term | **Very Low (-)** | Probable | Sure | Reversible |
| Impact on heritage resources: Archaeology: Preferred layout | No mit | Local | Medium | Long term | **Low (-)** | Definite | Low | Irreversible |
| | Mit | | | | No mitigation required | | | |
| Archaeology: Alternative layout | No mit | Local | Medium | Long term | **Low (-)** | Definite | Low | Irreversible |
| | Mit | Local | Medium | Long term | **Low (-)** | Probable | Sure | Irreversible |
| Palaeontology | No mit | Local | Low | Long term | **Low (-)** | Unlikely | Low | Reversible |
| | Mit | Local | Low | Long term | **Low (-)** | Unlikely | Sure | Reversible |
| Impact on local economy (employment) and social conditions | No mit | Regional | Medium | Long term | ***Medium (+)*** | Probable | Sure | Reversible |
| | Mit | Regional | Medium | Long term | ***Medium (+)*** | Probable | Sure | Reversible |
| Impact on visual | No mit | Local | Medium | Short term | **Low (-)** | Definite | Sure | Reversible |
| | Mit | Local | Medium | Short term | **Very Low (-)** | Probable | Sure | Reversile |
| Noise pollution | No mit | Local | Very Low | Short term | **Very Low (-)** | Probable | Sure | Reversible |
| | Mit | Local | Very Low | Short term | **Very Low (-)** | Probable | Sure | Reversible |
| Storage of hazardous substances on site | No mit | Local | Low | Short term | **Low (-)** | Probable | Sure | Irreversible |
| | Mit | Local | Low | Short term | **Low (-)** | Unlikely | Sure | Irreversible |
| Impact of dust | No mit | Local | Low | Short term | **Very Low (-)** | Probable | Sure | Reversible |
| | Mit | Local | Low | Short term | **Very Low (-)** | Probable | Sure | Reversible |

# 5 CONCLUSIONS AND WAY FORWARD

The purpose of this Chapter is to briefly summarise and conclude the EIAR and describe the way forward.

## 5.1 CONCLUSIONS

The proposed project comprises:

- Construction of a 100 MW PV plant;
- Associated infrastructure including:
    - Upgrade of existing internal farm roads to accommodate the construction vehicles; and

The following feasible alternatives were considered in the EIAR:

- Location alternatives:
    - One location for the proposed PV plant on Klipgats Pan; and
    - Electricity distribution via a 1.66 km or 2.14 km 132 kV connection to Kronos substation.
- Activity alternatives:
    - Solar energy generation via a PV plant; and
    - "No-go" alternative to solar energy production.
- Site layout alternatives:
    - Two layout alternatives.
- Technology alternatives:
    - Two technology alternative in terms of the solar panel type (PV vs. CPV);
    - Dual Axis tracking system to mount the panels; and
    - Four foundation options.

Aurecon submits that this Final EIAR provides a comprehensive assessment of the environmental issues associated with each of the feasible alternatives of the proposed project outlined in the FSR and the associated Plan of Study for EIA. These impacts and alternatives were derived in response to inputs from consultation with I&APs, provincial and local authorities, and the EIA project team.

**Table 5.1** provides a summary of the significance of the environmental impacts associated with this proposed project.

**Table 5.1: Summary of significance of the potential impacts associated with the proposed development[39]**

| **OPERATIONAL PHASE IMPACTS** | | No Mit | With Mit |
|---|---|---|---|
| 1 | Impact on botany | L | L |
| 2 | Impact on birds | L-M | L |
| 3 | Impact on fauna | L | L |
| 4.1 | Impact on surface water Aquatic | M | L |
| 4.2 | Stormwater | M | VL |
| 5 | Visual aesthetics | M-H | L-M |
| 6 | Impact on energy production | L+ | L+ |
| 7 | Impact on climate change | L+ | L+ |
| 8 | Impact on local economy (employment) and social conditions | M+ | M+ |
| 9 | Impact on agricultural land | VL | VL |
| 10 | Impact on surrounding land uses | L | Undetermined |
| **CONSTRUCTION PHASE IMPACTS** | | | |
| 11 | Impacts on flora, avifauna and fauna | L | VL |
| 12 | Sedimentation, erosion and aquatic ecology | L | VL |
| 13 | Impact on traffic | VL | VL |
| 14 | Visual impact | L | VL |
| 15.1 | Impact on heritage resources Archaeology: Preferred layout | L | Not required |
| 15.2 | Archaeology: Alternative layout | L | L |
| 15.3 | Palaeontology | L | L |
| 16 | Impact on local economy (employment) and social conditions | M+ | M+ |
| 17 | Noise pollution | VL | VL |
| 18 | Storage of hazardous substances on site | L | L |
| 19 | Impact of dust | VL | VL |

**KEY**

| | | | |
|---|---|---|---|
| H | High Significance | VL | Very Low Significance |
| M-H | Medium to High Significance | N | Neutral Significance |
| M | Medium Significance | H+ | High positive significance |
| L-M | Low to Medium Significance | M+ | Medium positive significance |
| L | Low Significance | L+ | Low positive significance |
| VL-L | Very Low to Low Significance | | |

[39] While some difference in magnitude of the potential impacts would result from the proposed alternatives this difference was not considered to be significant for any of the potential impacts. As such, the table applies to all proposed alternatives.

## 5.2 LEVEL OF CONFIDENCE IN ASSESSMENT

With reference to the information available at the feasibility stage of the project planning cycle, the confidence in the environmental assessment undertaken is regarded as being acceptable for the decision-making, specifically in terms of the environmental impacts and risks. The EAP believes that the information contained within the FSR and this EIAR is adequate to inform Mulilo's decision making regarding which alternatives to pursue and will allow DEA to be able to determine the environmental acceptability of the proposed alternatives.

It is acknowledged that the project details will evolve during the detailed design and construction phases to a limited extent. However, these are unlikely to change the overall environmental acceptability of the proposed project and any significant deviation from what was assessed in this EIAR should be subject to further assessment. If this was to occur, an amendment to the Environmental Authorisation may be required in which case the prescribed process would be followed.

## 5.3 OPERATIONAL PHASE IMPACTS

With reference to **Table 5.1**, the most significant (**medium to high (-)**) operational phase impacts on the biophysical and social environment, without mitigation was for the potential impacts of the proposed solar energy plant on visual aesthetics. With the implementation of mitigation measures the impact on visual aesthetics would decrease to **low-medium (-)**. It is not currently known what the significance of the impact on surrounding land uses would decrease to, however it is anticipated that, if required, mitigation measures agreed to in consultation with SKA would decrease to a level acceptable to SKA. It should be noted that two potential positive impacts on energy production, climate change and local economy (employment) and social conditions would result and these would be of **medium (+), low (+)** and **low (+)** significance (respectively), with and without mitigation measures.

In terms of differences in the significance of potential impacts of the feasible alternatives, there are none and as such Mulilo should choose their preferred alternative based on technical and financial considerations.

## 5.4 CONSTRUCTION PHASE IMPACTS

None of the negative construction phase impacts were deemed to have a significant impact on the environment, given their duration (approximately 18-30 months) and localised extent. The construction impacts were assessed to be of **very low to low (-)** significance, with and without mitigation measures with the implementation of the recommended EMP. It should be noted that a potential positive impact on local economy (employment) and social conditions would result and would be of **low (+)** significance, with and without mitigation measures.

## 5.5 RECOMMENDATIONS

Chapter 4 has outlined mitigation measures which, if implemented, could significantly reduce the negative impacts associated with the project. Where appropriate, these and any others identified by DEA could be enforced as Conditions of Approval in the Environmental Authorisation, should DEA issue a positive Environmental Authorisation. The mitigation measures are outlined below:

**Operation phase impacts:**

*Botanical impacts*

- A rehabilitation plan for the site should be compiled with the aid of a rehabilitation specialist and adhered to.
- Shallow depressions and well defined pans should be avoided, with buffer zones of at least 30 m around pans.

*Avifaunal (bird) impacts*

- Minimize the footprint of the development;
- Minimize noise and disturbance associated with maintenance activities at the plant once it becomes operational;
- Instituting a comprehensive impact monitoring scheme, and using the results of this scheme to inform and refine a dynamic approach to mitigation.

*Faunal impacts*

- Small ground level openings, 20-30 cm in height, should be allowed for in the electrical fence to facilitate the movement of small mammals and reptiles through the site.

*Surface water impacts*

- Monitoring, together with the development of an environmental management plan as operation proceeds will be the most effective strategy;
- Monitor both soil chemistry and erosion and mitigate if required;
- Implement erosion control measures should there be evidence of erosion;
- Should soil chemistry be affected (this is likely to be an increase in salinity), the nature of the washing mixture could be changed, or acceptable waste treatment employed;
- Remove perennial alien species such as *P. glandulosa* at sites disturbed or cleared, or where panel washing occurs;
- Install composting toilets that does not require water, septic tanks or soak-aways;
- Stormwater channels and "mitre" chutes should be constructed to direct the stormwater flows and minimize and control erosion. Each catchment covered by the site should have a separate drainage system and associated detention pond;
- Gravel roads should be graded and shaped with a 2 % crossfall back into the slope, allowing stormwater to be channelled in a controlled manor towards the natural drainage lines;
- Where roads intersect natural, defined drainage lines, suitably sized pipe culverts or drive through causeways should be installed or constructed;

- The minor storm design period should be used to determine the size of the earth channels. A return period of 1:5 years is applicable which approximates to an average intensity of 29 mm/hour; and
- The major storm occurrence (i.e. 1:25 year, 1:50 year & 1:100 year) should be used to calculate culverts in defined drainage lines and determine flood levels where necessary. The intensities for each occurrence are: 1:25 year – 45 mm/hour, 1:50 year – 52 mm/hour and 1:100 year – 60 mm/hour respectively.

*Visual impacts*

- All excess material shall be removed off-site, and all the ground shall be returned to original levels/gradients as far as possible;
- New structures should be placed where they are least visible to the greatest numbers of people, in places where the topography can offer shielding, where possible;
- Visibility of buildings and the local sub-station should be reduced by cladding the buildings in non-reflective colours and materials that will blend in with natural environment. E.g. cladding with local stone or plaster and paint with earthy tones for paint colours, roofs should be grey and non-reflective and doors and window frames should reference either the roof or wall colours;
- Finishing materials of the infrastructure (including support structures) should be of colours that are non-reflective and in dark matte colours such as dark grey or charcoal; and
- Information on the project should be provided to local people, such as through a poster at the entrance to the site.

*Impacts on local economy (employment) and social conditions*

- Give preference to local communities for employment opportunities; and
- Base recruitment on sound labour practices and with gender equality in mind.

*Surrounding land uses impacts*

- Implement measures recommended in the modelling study, as agreed to with SKA.

**Construction phase impacts:**

*Flora, avifauna and fauna impacts*

- In all cases construction of access roads should be designed for minimal impact. All construction should take place within the footprint of the proposed PV plant;
- A rehabilitation plan for the site should be compiled with the aid of a rehabilitation specialist and adhered to;
- Compile and implement a vegetation rehabilitation plan with the aid of a rehabilitation specialist, for inclusion in the Construction EMP. The specialist is to recommend species to be used in rehabilitation as well as any special measures for rehabilitation such as shade-netting and alien vegetation removal;

- The construction phase should be closely monitored by an Environmental Control Officer who should identify any areas that would require rehabilitation in the post-construction phase. The restoration of those areas must follow the construction phase;
- Demarcate no-go areas identified during pre-construction monitoring;
- Low-lying depressions and watercourses should be avoided wherever possible;
- Shallow depressions and well defined pans should be avoided and buffered by at least 30 m; and
- The site should be cleared in sections as required for construction and not all at once.

*Sedimentation, erosion and aquatic ecology impacts*

- The proposed project should be located away from the no-go areas, including a 30 m buffer area around these no-go areas;
- Access roads should be positioned in such a way that no clearing within no-go areas is required and definite drainage areas should be avoided;
- Should additional access roads be required, these should be limited to one crossing point and built with culverts to prevent the impediment of water movement;
- The use of erosion control measures to minimise erosion at excavation / clearing sites or aggregate storage sites;
- Earth moving construction activities should take place in the dry season as far as possible; and
- Remove perennial alien species such as P. glandulosa at sites disturbed or cleared by construction activities.

*Heritage resources (including palaeontology) impacts*

- The complex LSA sites on the hill to the south, as well as the historical buildings on the alternative site should be demarcated as a no-go area during construction;
- Destruction of these structures would require a detailed survey and recording of the entire complex, as well as a permit from the relevant heritage authority;
- Archaeological sites (areas indicated with a red dot on Figure 4.10) should be mitigated by excavation and sampling of sites before the start of construction should they be threatened by construction activities; and
- In the event of accidental uncovering of graves or substantial fossil remains (e.g. vertebrate bones and teeth, large blocks of petrified wood), work must stop immediately and SAHRA should be notified. An archaeologist / palaeontologist should be involved to assist with the investigation and procedures to address the situation.

*Impacts on local economy (employment) and social conditions*

- Give preference to local communities for employment opportunities; and
- Base recruitment on sound labour practices and with gender equality in mind.

*Transportation impacts*

- Ensure that road junctions have good sightlines;
- Implement traffic control measures where necessary;
- Transport components overnight as far as possible; and

- Engage with the roads authorities prior to construction to ensure the necessary road upgrades, permits, traffic escorts etc. are scheduled.

*Visual impacts*
- Minimise the construction period, where possible;
- Access road are to be kept tidy, and measures shall be taken to minimise dust from construction traffic on gravel roads;
- Topsoil should be removed, conserved and used for rehabilitation; and
- Site offices, if required, should be limited to single storey and they should be sited carefully using temporary screen fencing to screen from the wider landscape

*Noise impacts*
- Implement measures as provided in the EMP, which includes procedures for dealing with noise.

*Storage of hazardous substances on site*
- Implement measures as provided in the EMP, which inter alia specify the storage details of hazardous compounds and the emergency procedures to follow in the event of a spillage; and
- Comply with the various pieces of legislation controlling the use of hazardous substances at a construction site.

*Dust impacts*
- Implement measures as provided in the EMP, which includes procedures for dealing with dust pollution events including watering of roads, etc.

### *5.5.1 Considerations in identification of preferred alternative*

Following the finalisation in the EIAR, the next step in the EIA process is for Mulilo to identify their preferred option, utilising this EIAR together with technical, financial and other considerations to inform their decision.

The proposed project results in **low to medium (+)** significance impacts and **medium to high (-)** significance impacts, without mitigation, on the environment. The negative impacts of the proposed project are considered to be environmentally acceptable, considering the positive impacts and considering that the significance of impacts would reduce to **low-medium to very low (-)** with the implementation of mitigation measures.

In terms of differences in the significance of potential impacts of the feasible alternatives, there are none and as such Mulilo should choose their preferred alternative based on technical and financial considerations.

### *5.5.2 Opinion with respect to environmental authorisation*

Regulation 32(2)(m) of the EIA Regulations requires that the EAP include an opinion as to whether the activity should be authorised or not. The impacts associated with the proposed project would result in regional impacts (both biophysical and socio-economic) that would negatively affect the area. The significance of these impacts **without mitigation** is deemed to be of **medium or lower** significance. However, with the implementation of the recommended mitigation measures the significance of the negative impacts would be minimized and would be **low or very low**, for all but one impact.

Associated with the proposed project are positive impacts on energy production, climate change and local economy (employment) and social conditions of **low to medium (+)** significance.

Based on the above, the EAP is of the opinion that the proposed solar energy facility and associated infrastructure, including alternatives, being applied for be authorised as the benefits outweigh the negative environmental impacts. The significance of negative impacts can be reduced with effective and appropriate mitigation through a Life-Cycle EMP, as described in this report. If authorised, the implementation of an EMP should be included as a condition of approval.

## 5.6 WAY FORWARD

### *5.6.1 Final EIA Report*

The Draft EIAR was lodged at the Prieska (Elizabeth Vermeulen) Public Library, Ietznietz in Copperton and on the Aurecon website (www.aurecongroup.com - change "Current Location" to "South Africa" and follow the Public Participation links). All registered I&APs were notified of the availability of the Draft EIAR by means of a letter which included a copy of the Draft EIAR Executive Summary. The public had until 22 May 2012 to submit written comment on the Draft EIAR to Aurecon.

The Final EIAR was completed via the addition of any I&AP comments and the addition of a letter from Mulilo indicating which mitigation measures will be implemented. The Final EIAR was then submitted to the Northern Cape DEANC and DEA for their review and decision-making, respectively.

The Final EIAR was made available for review at the same locations as the Draft EIAR. Comments received on the Final EIAR were not be included in a Comments and Response Report but were instead collated and forwarded directly to DEA.

Once DEA had reviewed the Final EIAR, they had to ascertain whether the EIA process undertaken met the legal requirements and whether there was adequate information to make an informed decision. Should the above requirements be met, they then needed to

decide on the environmental acceptability of the proposed project. Their decision was documented in an Environmental Authorisation, which details the decision, the reasons therefore, and any related conditions. Following the issuing of the Environmental Authorisation, DEA's decision was communicated by means of a letter to all registered I&APs and the appeal process commenced, during which any party concerned had the opportunity to appeal the decision to the Minister of Environmental Affairs in terms of NEMA.

### *5.6.2 Split Final EIA Report*

It is now proposed that the original EIA report be amended into 2 separate documents in support of the separate authorisations, i.e. one considering and assessing the impacts associated with the main PV facility and one considering and assessing the impacts associated with the grid connection respectively. The EMPr will also be amended to separately consider the PV facility and the grid connection.

In terms of Condition 5 of the Environmental Authorisation, it is possible for an applicant to apply, in writing, to the competent authority for a change or deviation from the project description to be approved. In this regard, an application has been submitted to the Department of Environmental Affairs (DEA), as the Competent Authority, and it has been confirmed that a Part 2 process is to be followed in terms of Regulation 32 of the EIA Regulations, 2014.

Split EIA reports have been prepared by Savannah Environmental in support of the application. In terms of Chapter 6 of the EIA Regulations, these documents are being made available for public review and comment. The 30-day review period is from 4 May 2016 to 3 June 2016. The documentation can be downloaded at www.savannahSA.com.

Once the review period has ended all comments received during the review period for the amended (split report) will be included in a Comments and Response report for final submission to DEA for decision making.

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