CEN INTEGRATED ENVIRONMENTAL MANAGEMENT UNIT

Environmental and Rural Development Specialist

FINAL Scoping Report for the Proposed Construction and Operation of a 55 MW Photovoltaic Solar Farm and associated infrastructure on Portion 2 of the Farm Kraan Vogel Kuil No 50, Pearston, Eastern Cape

March 2012

Project Title:
FINAL Scoping Report for the Proposed Construction and Operation of a 55 MW Photovoltaic Solar Farm and associated infrastructure on Portion 2 of the Farm Kraan Vogel Kuil No 50, Pearston, Eastern Cape

Project Applicant: Imveloyethu Power Company (Pty) Ltd

NEAS Reference Number: DEA/EIA/0000855/2011
DEA Reference Number: 12/12/20/2657

Environmental Assessment Practitioner:
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Document prepared by: Dr Belinda Clark
Document reviewed by: Dr Mike Cohen

Executive Summary

CEN Integrated Environmental Management Unit was appointed by Imveloyethu Power Company (Pty) Ltd to undertake an environmental assessment (Scoping and EIA), for the proposed construction and operation of a 55 MW Photovoltaic Solar Farm and associated infrastructure on Ptn 2 of the Farm Kraan Vogel Kuil No 50 in Pearston in the Eastern Cape.

The environmental decision making authority for the EIA is the National Department of Environmental Affairs and an environmental impact report is required in terms of the Regulations promulgated under Section 24(5) read with Section 44 of the National Environmental Management Act 107 of 1998 as amended (Government Notice R.543 in Government Gazette 33306 of 10 December 2010).

Terms of Reference

The Terms of Reference established for the environmental assessment of the proposed development are:

- Conduct the necessary environmental investigations in order to produce the required scoping report for the proposed development and associated activities
- Identify potential significant negative and positive environmental impacts associated with the proposed development
- Identify and describe reasonable and feasible project alternatives
- Engage the public and relevant stakeholders throughout the environmental assessment process and incorporate all comments in the Scoping Report

Site Description

The proposed site for development is Ptn 2 of the Farm Kraan Vogel Kuil No 50 in Pearston in the Eastern Cape. The site is situated approximately 2.2 km west of the village of Pearston and south of the R337 at approximate GPS co-ordinates

32°35'59.85"S 25°06'44.16"E, and is currently zoned for agricultural purposes. It is proposed to use four areas of the farm for the solar plant with a disturbance footprint of ~138 ha (refer to the figure below). The site has been specifically located in close proximity to the existing powerlines and access roads to avoid constructing additional infrastructure.

The terrain is undulating with low stony ridges and outcrops of plinthite with shallow often gravelly soils interspersed by flats where soils are deeper. No drainage lines intercept these areas, the ground falling off to drainage lines to the south and north. The vegetation on the site is mostly low shrubs and some grass with scattered taller shrubs and small bushclumps in the more rocky areas (Jacobsen, 2011).

Existing structures in close proximity to the site include an Eskom power line, a telephone line, roads, a windmill and reservoir, and farm fences. The site is currently mostly grazed by sheep.

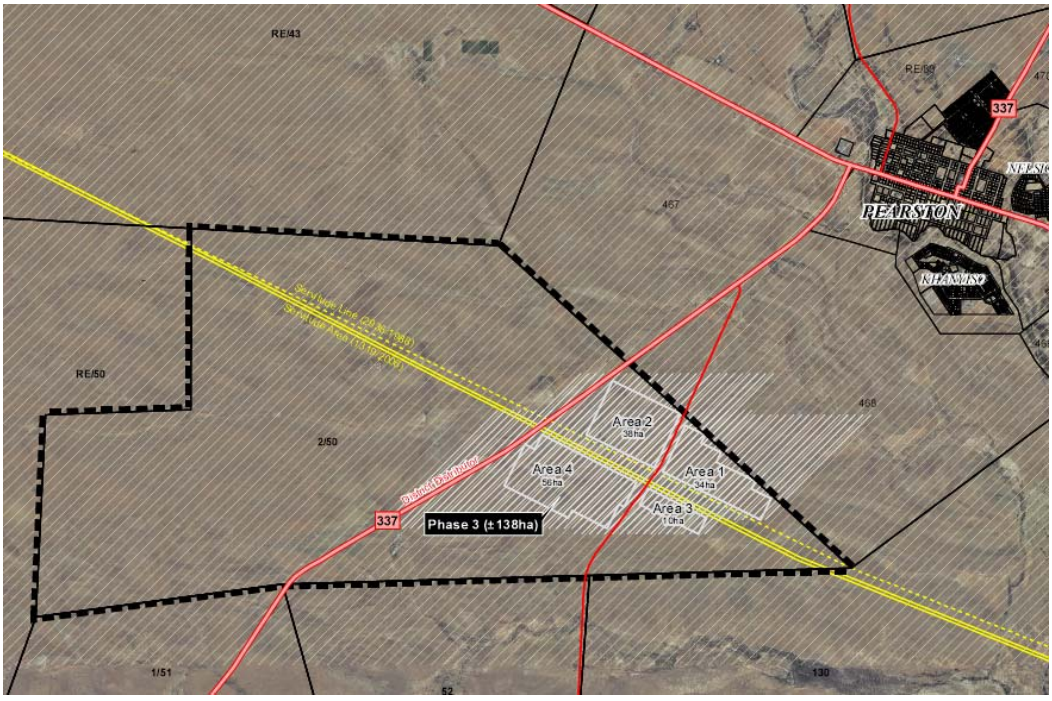

Figure: An aerial image showing the relative location of the 4 areas selected for the solar farm.

The Development Proposal

It is proposed to construct and operate a 55 MW photovoltaic solar farm. The proposed development will consist of Polycrystalline Fixed Solar Panels; using the photovoltaic approach to generate electricity from the sun. Photovoltaic (PV devices) or “solar cells” change sunlight directly into electricity. PV, like a fuel cell, relies upon chemical reactions to generate the electricity. PV cells are small, square shaped semiconductors manufactured in thin film layers from silicon and other conductive materials. When sunlight strikes the PV cell, chemical reactions release electrons, generating electric current. The small current from individual PV cells, which are installed in modules, can power individual homes and businesses or can be plugged into the bulk electricity grid.

Structures and associated infrastructure include:

- PV solar panels/modules arranged in arrays
- Poles to support PV modules – these will likely be rammed into the soil at a depth of 1 to 2 m, and will be ~60 cm above ground level
- A 55 MW substation
- Transmission lines (<33 KV) from the substation to the on-site powerline and a possible link between proposed solar facilities on neighbouring sites,
- Primary and secondary cable paths
- String boxes and inverters
- Transformer cabin/inverter
- Electricity distribution boxes
- Earthing systems
- Guardhouse
- Security fence and security system along perimeter of site
- Internal gravel roads for along the boundary of the site and between PV lines

Listed Activities

National Environmental Management Act (Act 107 of 1998)

The Minister of Environmental Affairs and Tourism has in terms of sections 24 and 24D of the National Environmental Management Amendment Act (Act No. 107 of 1998), listed the activities that require an environmental assessment.

In terms of the Environmental Impact Assessment Regulations, 2010, made under section 24(5) of the Act and published in Government Notice R.543 in Government Gazette 33306 of 10 December 2010 the following activities are subject to an assessment.

No. R. 544	**10 December 2010 – Listing 1**
Activity number	**Activity description**
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4	The construction of a road wider than 4 metres with a reserve less than 13,5 metres (a) In the Eastern Cape (ii) outside urban areas (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans
13	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (a) Critical biodiversity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority
14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (a) In the Eastern Cape (i) all areas outside urban areas
16	The construction of: (iii) buildings with a footprint exceeding 10 square metres in size; or (iv) infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse (a) In the Eastern Cape (ii) outside urban areas (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans

Methodology

The specific methodology adopted in identifying and assessing impacts and project alternatives is described in Chapter 5 of the Scoping Report. The Environmental Impact Assessment Regulations (2010) clearly state the requirements that need to be fulfilled by all role-players involved in the Environmental Assessment Process. In this regard, Regulations 28 to 33 list the requirements that an EAP must fulfill in order

to compile a comprehensive Environmental Impact Report and Management Programme. The methodology was designed to meet the requirements of the EIA Regulations (2010) and guidelines published in support of the regulations.

Alternatives

The 'no-go' option

The no-go alternative assumes the status quo remains – i.e. the site is used for stock grazing purposes.

According to CARA (Conservation of Agricultural Resources Act 43 of 1983) the official carrying capacity for the area is 17 ha per large stock unit. CARA seeks to provide for the conservation of natural agricultural resources by maintaining the production potential of land, combating and preventing erosion and weakening or destruction of water resources, protecting vegetation and combating weeds and invader species. According to Veld types of South Africa by J.P.H Acocks the site falls in zone no. 31 (Succulent Karoo) that consists mainly of short karoo bushes, succulent plants, scrubs and grasses. The estimated area needed for the 55 MW plant will is ± 138 ha which will mean a loss of only 8.1 Large Stock Units or 54 Small Stock Units. It will not be a total loss as this area can still be utilized by sheep and / or goats. The solar plant will be fully compatible with veld management systems where they are farming with sheep. The intervention of the solar plant will be minimal (extracted from a letter of support for the project written by the Eastern Cape Department of Agriculture, Rural Development and Agrarian Reform – Mr A Snyman).

The Integrated Development Plan for the Blue Crane Route Municipality highlights the need for energy and the upgrading of electrical infrastructure, as well as local economic development. The proposed solar farm will contribute to meeting these needs. Significant employment opportunities are expected in construction and operational phases. The applicant proposes to supply alternative energy to local schools and provide financial aid through educational scholarships to the local community. The solar farm project is a registered project in the municipalty's Integrated Development Plan and is supported by the municipality and the Blue Crane Route Development Agency.

Mucina and Rutherford (2006) classify the vegetation type as Eastern Lower Karroo which is considered to be least threatened and there are no megaconservancies that traverse the site according to the regional Subtropical Thicket Ecosystem Plan (STEP). However, the site is classified as a Broad Land Management Class 2 in the East Cape Biodiversity Conservation Plan which implies that the site is suited for limited development in non-sensitive areas, and should ideally be maintained in a near-natural state. The site is currently farmed and although substantial floral species richness still occurs, vegetation has been transformed from its original status and overgrazing is evident.

It is therefore believed that the site and project activity are not fatally flawed from consideration and assessment for the proposed solar farm. The 'no-go option will however be used as a baseline throughout the assessment process against which potential impacts will be compared in an objective manner.

Site alternatives

As a starting point, the applicant considered various aspects to determine a suitable location for a solar farm in the Pearston area including, but not limited to, irradiation levels, the distance to the power grid, site accessibility, founding conditions, fire risk and current land uses. The Farm Kraan Vogel Kuil just west of Pearston met these criteria. A 10 MW solar farm has been approved north of the R337 in the north-eastern portion of the farm and an application has been submitted for a second 10 MW solar farm on commonage land directly east of and adjacent to the proposed site for this application (refer to blue stars in the Figure below).

The selected farm was then scanned and aspects such as hydrology, sensitive vegetation and other habitats, and proximity to existing infrastructure were used to determine the selected areas (i.e. Area 1 to 4 as shown in the Figure below). The selected blocks are adjacent to existing powerlines and are close by to the approved 10 MW solar plant north of the R337 and the proposed plant east of the site, providing opportunities of shared infrastructure and increased efficiency. Drainage features (blue lines in the Figure below) were also avoided. A Level 1 Archaeological Impact Assessment was done for the selected area and the specialist concluded that it is of low cultural sensitivity and that development can proceed as planned. The archaeological specialist noted panels must be constructed within 20 metres of the

concentration of Later Stone Age stone tools (GPS reading: 32.36.019S; 25.06.379E) (refer to Appendix 5). An ecological specialist report was done of the selected area. The vegetation has been subjected to overgrazing with the result that species composition has changed from its original state. However, the area still exhibits substantial floral species richness, and a single occurrence of a threatened species, *Duvalia parviflora*, was recorded. The location of this species, and others that were not found in large numbers in the area (e.g. *Aloe longistyla, Astroloba foliolosa, Haworthia nigra, Duvalia* sp. cf *parviflora, Adromischus subdistichus, Aloe claviflora*) was demarcated using a hand-held GPS and indicated on a map to the applicant to be protected with a 10 m buffer around each recording. The agricultural specialist (report attached as Appendix 3) recommended that no panels or other development occur within 100 m of the drainage line that occurs south of Area 3 and 4 (refer to blue line in the Figure below). These recommendations were given to the applicant to use in the preferred layout plan. This will be presented in the EIA.

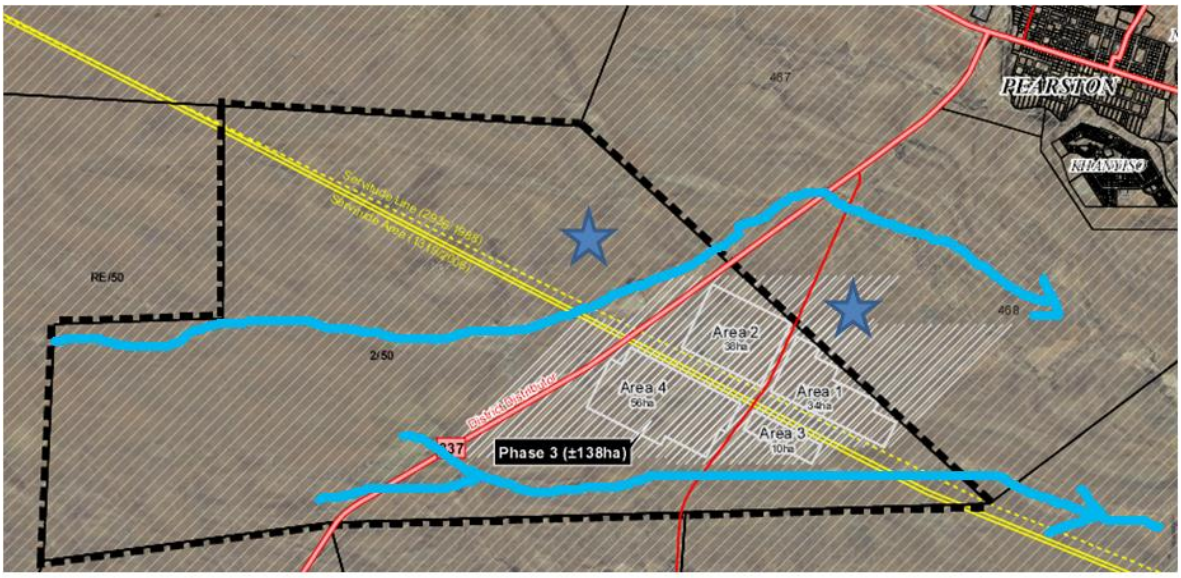

Figure: Site alternative selection.

Activity Alternatives

The current land use activity is agriculture (specifically grazing), while the proposed activity is for the establishment of a PV Solar Farm. The local Municipality is the provider of electricity within Blue Crane Route. The formal supply of electricity ranges from a full connection and prepaid system to a ready board system. The majority of consumers have access to either electricity or paraffin as a source of power and heat while street lighting is provided to all urban neighbourhoods except for high mast

lighting in Aeroville, Old Location, New Brighton and Francesvale (Somerset East Urban Area). A major capital outlay is however envisaged to upgrade both urban and rural networks. The overhead line from Somerset East to Pearston and other areas is currently running at full capacity. A new transformer is to be installed as an emergency measure. Electricity has been included in the infrastructure analysis because of the importance of this basic service in the lives of all individuals, especially in this area. The Blue Crane Route Municipality has a good infrastructure base but upgrading is needed in order for the service to be provided effectively. A need for energy provision and infrastructure upgraded is therefore evident.

Of the entire Blue Crane Route population a mere 35% of the economically active population is employed and over 40% is not economically active. This puts a great amount of pressure on the employed population to support those that are not employed or economically active and creates a large dependency ratio on the employed percentage. The unemployment rate in the area is approximately 24% (SDF 2006). The photovoltaic plant will create a number of job opportunities for local staff in both the design and "permitting" phase and primarily in the operational phase. There will be a training programme for locals interested in skilled work such as maintenance work. Furthermore, local businesses will also benefit from the proposed development since materials will be purchased locally where available. The BCRM SDF and IDP have highlighted the need for local economic development initiatives.

According to the Department of Agriculture the proposed site consists of non-arable low potential grazing land. The Department of Agriculture has determined the grazing capacity for this area as 26-30 ha/AU. The proposed solar farm will occupy ~135 ha, therefore a loss of grazing capacity for ~ 5 animal units is expected if the solar farm is approved. The number of employment opportunities and/or economic potential for the municipal area that will accrue from agriculture in this instance is substantially less than for the proposed PV Solar Farm. From an economic and social upliftment perspective, the solar farm is therefore the preferred activity.

Technology Alternatives

Two alternative technologies were considered for the solar farm: Crystalline Silicone PV Modules and Thin Film PV Modules. The applicant has selected a crystalline silicone PV module Installation for the following reasons:

While thin film PV modules are more cost effective than Polycrystalline Fixed Solar Panels, thin film modules are less efficient in terms of electricity generation. A much greater number of cells must be used to generate the same amount of electricity as can be generated from crystalline cells. This can result in additional racking and installation costs and more space and mounting hardware would be required to produce the same amount of output.

Potential Impacts

The following potential impacts have been identified for further study in the EIR:

Potential Impact	**Development Phases**
Loss of Biodiversity	Construction and Operational
Potential Pollution	
• Noise	Construction
• Air (dust and traffic)	Construction (mostly) and Operational
• Surface Water	Construction (mostly) and Operational
• Groundwater	Construction (mostly) and Operational
• Soil	Construction (mostly) and Operational
Soil erosion	Construction (and operational if rehabilitation is not successful or if stormwater is not properly managed)
Socio-Economic Impacts	Construction and Operational
Visual impacts	Operational
Loss of Agricultural Land	Operational
Archaeological Impacts	Construction (unlikely)
Climate change impacts	Operational
Cumulative Impacts:	
Loss of biodiversity	Construction and Operational
Socio-Economic Impacts	Construction and Operational

Specialist Studies

The following specialist studies will be done as part of the EIR:

- Ecological Specialist Study
- Agricultural Specialist Study
- Level 1 Archaeological Impact Assessment
- Socio-economic Impact Assessment

Public Participation

Public participation was done in accordance with Chapter 6 (Regulations 54 to 57) of the EIA Regulations (2010) and Guideline 4 published in assistance of interpretation of these regulations. Adverts were placed in *The Herald* and *Die Burger* and the *Somerset East Budget,* and two notices were placed on site and at the Pearston municipal offices inviting interested parties to register and make comment on the proposed development. Background Information Documents detailing the proposed development were distributed to identified stakeholders (e.g. government, municipal and non-government organisations; neighbours and organisation representatives). Below is a "comments and response sheet" including all issues raised by Interested and Affected Parties as well as the response by the Environmental Assessment Practitioner.

The Draft Scoping report was submitted to the National Department of Environmental Affairs for review purposes. The Provincial Department of Economic Development and Environmental Affairs received a copy of the report for commenting. All registered parties were sent an electronic copy of the Executive Summary and were notified of the importance of commenting and identifying any issue which CEN IEM Unit may have overlooked and which they feel needs to be addressed in the EIA. A full copy of the Draft Scoping Report was made available in electronic format to all those that requested it.

The period for stakeholder comment has expired and no comments were submitted by any Interested and Affected Parties.

I&AP	Comment	EAP response
K Moolman	Request to be registered	Registered and will be kept updated of the process
L. Mongoato (Director: Land Use and Soil Management)	This serves as a notice of receipt and confirms that your application has been captured in our electronic AgriLand tracking and management system. Reference number issued	Reference number noted. Will be kept updated of the process
B. Smith	Request to be registered and am in favour of the development	Registered and will be kept updated of the process
M. Kane	Request to be registered and am in favour of the development	Registered and will be kept updated of the process
G. Mintoor	Request to be registered and am in favour of the development	Registered and will be kept updated of the process
J. Martin	Request to be registered and am in favour of the development	Registered and will be kept updated of the process

Structure of the Report

Chapter 1 of the report presents a background to the Scoping procedure. **Chapter 2** describes the proposed development property**. Chapter 3** describes and explains the project proposal and places it in context with relevant planning guidelines. **Chapter 4** describes the receiving environment and details relevant environmental planning guidelines. **Chapter 5** identifies and describes project alternatives. **Chapter 6** describes the methodology that will be followed in deriving and assessing impacts and alternatives, and ensuring the report is in compliance the relevant legislation,

regulations and guidelines. **Chapter 7** lists and describes potential environmental issues and impacts that will be considered further in the EIR. **Chapter 8** presents a Plan of Study for EIA. **Chapter 9** details the public participation phase up to the Scoping Phase. **Chapter 10** is a reference list.

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Chapter 1: Introduction

CEN Integrated Environmental Management Unit was appointed by Imveloyethu Power Company (Pty) Ltd to undertake an environmental assessment (Scoping and EIA), for the proposed construction and operation of a 55 MW Photovoltaic Solar Farm and associated infrastructure on Ptn 2 of the Farm Kraan Vogel Kuil No 50 in Pearston in the Eastern Cape.

The environmental decision making authority for the EIA is the National Department of Environmental Affairs and an environmental impact report is required in terms of the Regulations promulgated under Section 24(5) read with Section 44 of the National Environmental Management Act 107 of 1998 as amended (Government Notice R.543 in Government Gazette 33306 of 10 December 2010).

This chapter presents the background to the Scoping Report and includes an overview of the structure of the report.

Purpose of the Environmental Scoping Report

The main purpose of this Environmental Scoping report is to:

- Make application to the National Department of Environmental Affairs to undertake the listed activities
- Describe the proposed activity and nature of the receiving environment in sufficient detail to allow the reader to make an informed decision on the suitability of the project proposal
- Identify feasible and reasonable project alternatives
- Identify and describe environmental issues and potential impacts
- Solicit issues and concerns from Interested and Affected Parties on the proposed development and address the environmental concerns raised.
- Describe the methodology that will be followed in assessing impacts and alternatives
- Develop a plan of study for EIA, including a Terms of Reference for any specialist studies

Terms of Reference

The Terms of Reference established for the environmental assessment of the proposed development are:

- Conduct the necessary environmental investigations to produce the required scoping report
- Identify potential significant negative and positive environmental impacts associated with the proposed activities
- Identify and describe reasonable and feasible project alternatives
- Engage the public and relevant stakeholders throughout the environmental assessment process and incorporate all comments in the Scoping Report

This environmental scoping assessment was designed to obtain sufficient information to evaluate the proposed activities and to determine and identify

potential significant impacts. The information contained in this report will guide the further investigation for the environmental impact assessment, allow for specialist Terms of Reference to be established if necessary, and assist the authorities in making an informed decision when considering the application for the development.

The application procedure as defined by the Department of Environmental Affairs is illustrated in Figure 1.

Expertise of Responsible Environmental Practitioners and of CEN Integrated Environmental Management Unit[1]

Curriculum Vitae of the persons responsible for the compilation of this Scoping Report are attached as Appendix 1.

The project team consists of the following members:

- Project Manager: Bongani Mashwama
- Environmental Consultants: CEN IEM Unit
- Town Planners: Urban Dynamics

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[1] **Included in Terms of Section 29 1a of the Regulations published in terms of Chapter 5 Of the National Environmental Management Act, 1998 (No. R. 38521 April 2006)**

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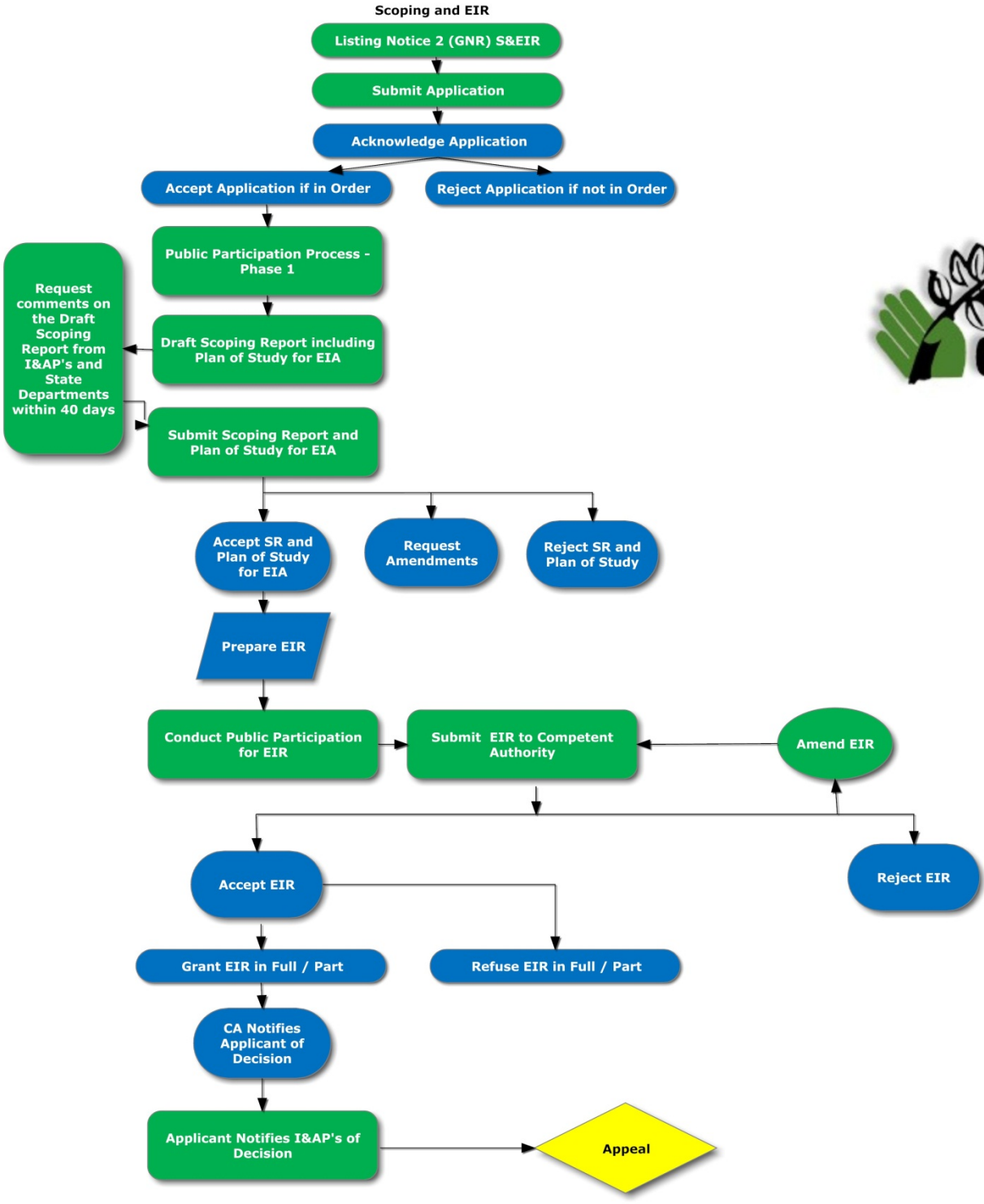

➢ **Figure 1: Application Procedure for Activities in Terms of Section 24(5) of the National Environment Management Act 1998**

Chapter

2

Chapter 2: Property Description

The proposed site for development is Ptn 2 of the Farm Kraan Vogel Kuil No 50 (title deed attached as Appendix 2) in Pearston in the Eastern Cape. The site is situated approximately 2.2 km west of the village of Pearston and south of the R337 at approximate GPS co-ordinates 32°35'59.85"S 25°06'44.16"E, and is currently zoned for agricultural purposes. It is proposed to use four areas of the farm for the solar plant with a disturbance footprint of ~138 ha (refer toFigure 2). The site has been specifically located in close proximity to the existing powerlines and access roads to avoid constructing additional infrastructure.

The terrain is undulating with low stony ridges and outcrops of plinthite with shallow often gravelly soils interspersed by flats where soils are deeper. No drainage lines intercept these areas, the ground falling off to drainage lines to the south and north. The vegetation on the site is mostly low shrubs and some grass with scattered taller shrubs and small bush clumps in the more rocky areas (Jacobsen, 2011).

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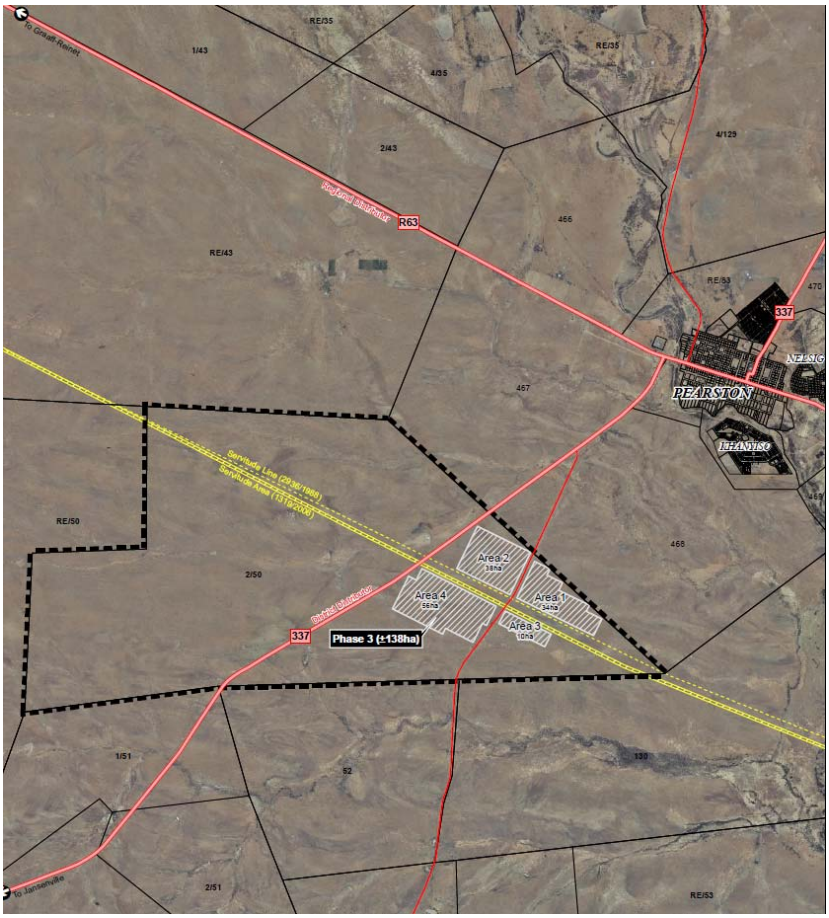

- **Figure 2: An aerial image showing the location of the study site (white hashing) (Source: Urban Dynamics).**

- **Figure 3: A view of Area 1 of the site in a south-easterly direction.**

- **Figure 4: A view of Area 2 of the site. Note the stoney 'ridge' in the foreground with scattered bush clumps.**

- **Figure 5: A view of Area 3 of the site. Note the drainage line in the south which falls outside of the site.**

- **Figure 6: A view of the south-eastern part of Area 4 of the site. Note the windmill and reservoir in the background.**

- **Figure 7: A view of Area 4 of the site in a north-easterly direction.**

Chapter

3

Chapter 3: Project Description

The development proposal

It is proposed to construct and operate a 55 MW photovoltaic solar farm. The proposed development will consist of Polycrystalline Fixed Solar Panels; using the photovoltaic approach to generate electricity from the sun. Photovoltaic (PV devices) or “solar cells” change sunlight directly into electricity. PV, like a fuel cell, relies upon chemical reactions to generate the electricity. PV cells are small, square shaped semiconductors manufactured in thin film layers from silicon and other conductive materials. When sunlight strikes the PV cell, chemical reactions release electrons, generating electric current. The small current from individual PV cells, which are installed in modules, can power individual homes and businesses or can be plugged into the bulk electricity grid.

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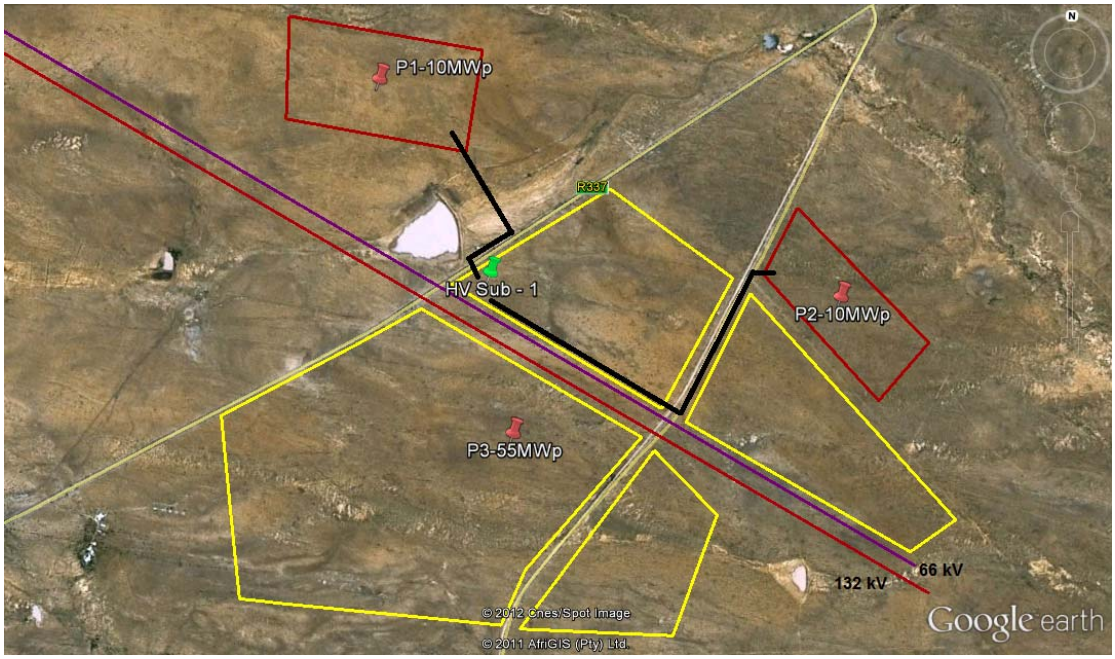
- **Figure 8: A photo of an inverter and MV housing**

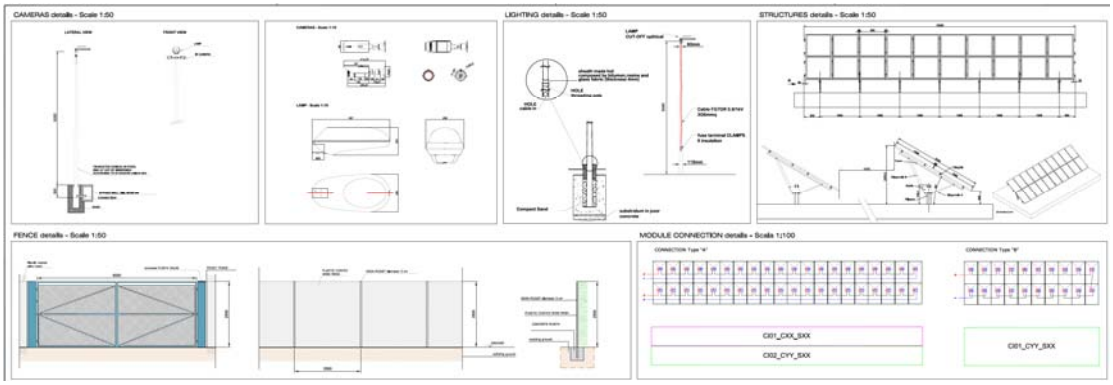
- **Figure 9: A photo of mechanical structures for PV module support.**

- **Figure 10: A photo of a string box (red circle).**

- **Figure 11: Perimeter fencing.**

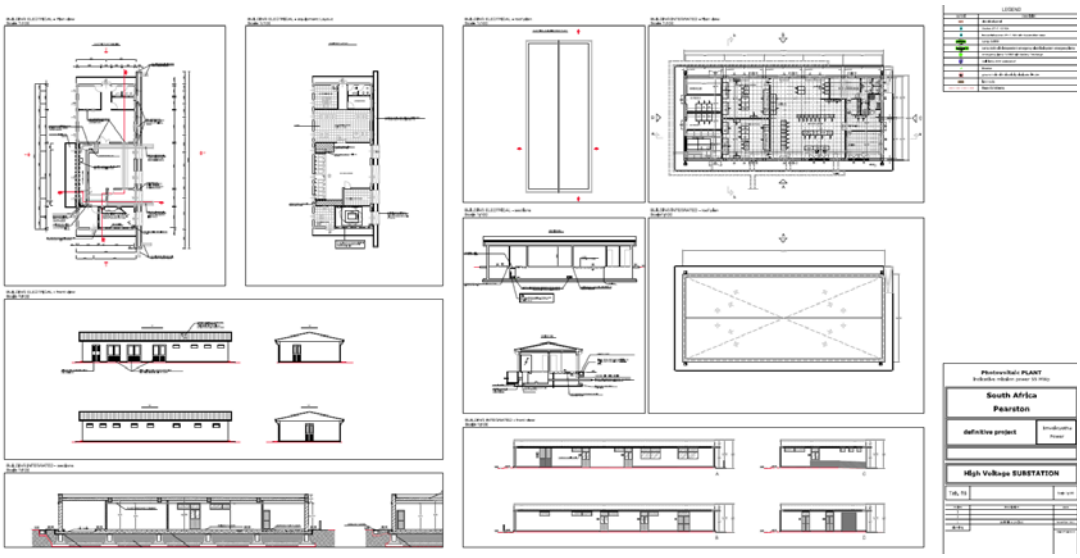


- **Figure 12: Preliminary route of cabling paths (black line) from two solar farms to the substation at the proposed 55 MW farm (this application).**

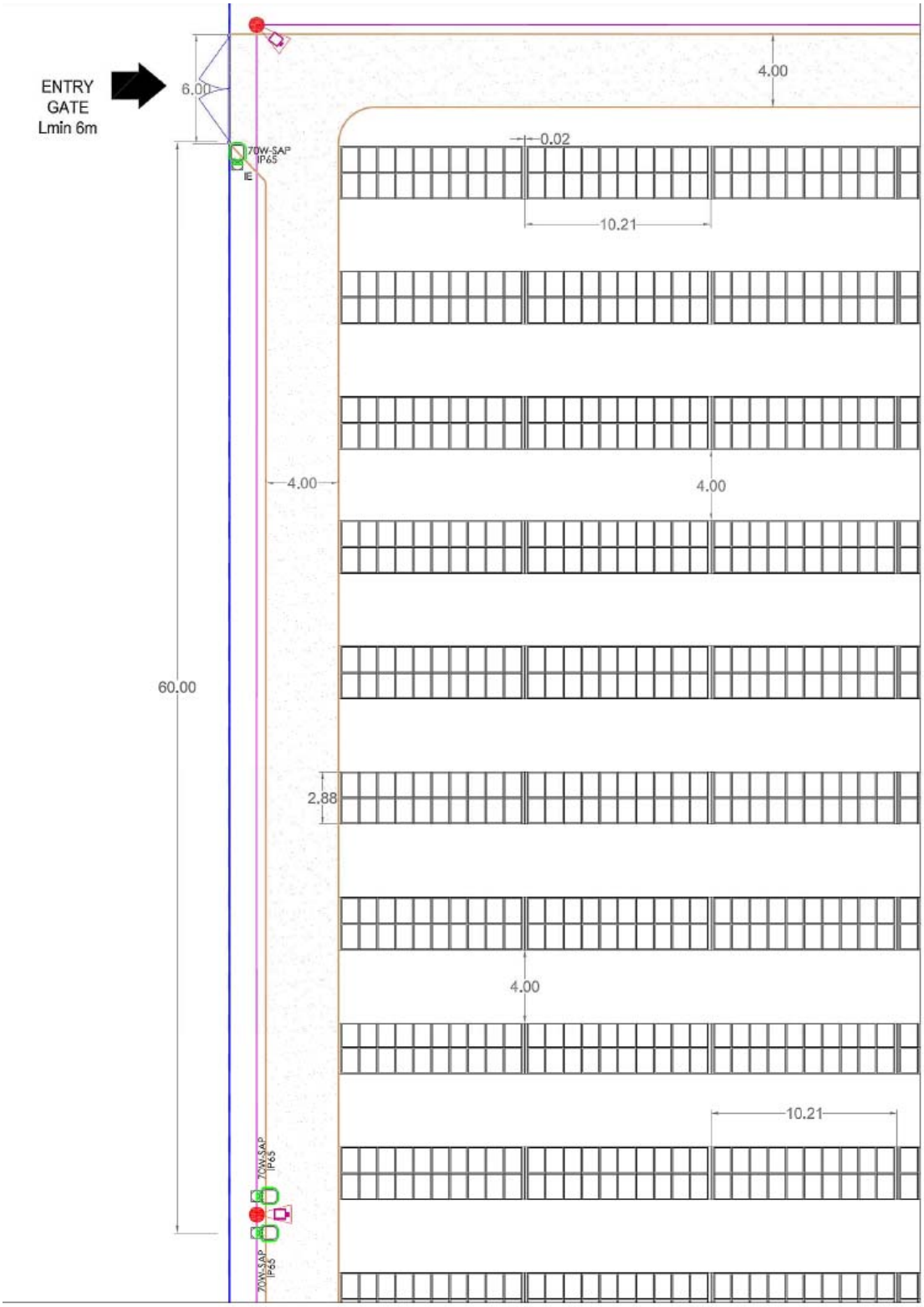


- **Figure 13: Plan of structures, fencing and lighting.**

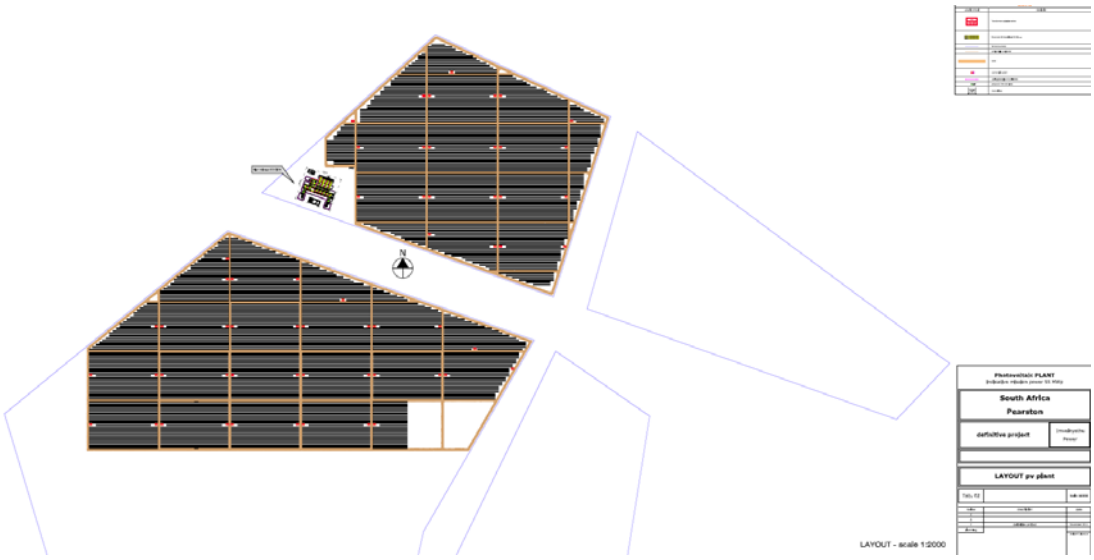
➢ **Figure 14: Plans of the electrical distribution cabin.**



➢ **Figure 15: Substation layout.**



➢ **Figure 16: Plan of a section of the plant showing distances between panels and buffers from the boundary fence.**



- **Figure 17: A schematic layout of a section of the plant, showing the location of the 55 MW substation, transformer cabins, internal roads, security cameras, cables and control box.**

3.1.1 National Environmental Management Act (Act 107 of 1998)

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Activity number	**Activity description**
4	The construction of a road wider than 4 metres with a reserve less than 13,5 metres (a) In the Eastern Cape (ii) outside urban areas (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans
13	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (b) Critical biodiversity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority
14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (a) In the Eastern Cape (i) all areas outside urban areas
16	The construction of: (iii) buildings with a footprint exceeding 10 square metres in size; or (iv) infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse (a) In the Eastern Cape (ii) outside urban areas (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans

3.1.2 National Heritage Resources Act 25 of 1999

The South African Heritage Resources Agency (SAHRA) was established in 1999. SAHRA is responsible for protecting heritage resources of national significance. According to Section 38 of the National Heritage Resources Act 25 of 1999, the responsible heritage resources authority must be notified of all new developments that will change the character of a site. SAHRA was notified of the proposed development by sending them a Background Information Document. A specialist has been appointed to do a Level 1 Archaeological Impact Assessment which will be submitted with the EIA.

Need and Desirability

CRITERIA RELATED TO LAND-USE PLANNING	
Is there a published **EMF** in place for the area in question?	No
If yes, do the reports and information submitted convincingly demonstrate that the proposed activity is consistent with the EMF?	n/a
Do the reports and information submitted convincingly demonstrate that the proposed activity is **in line with the projects and programs identified as priorities within the IDP of the local authority**?	Yes, the IDP highlights the need for local economic development in the area, and it is noted that infrastructure (including energy provision) needs to be upgraded and supplemented.
Is there a formal communication from the local authority on record that	Yes, refer to the letter from the Blue Crane Route Development Agency inserted below this table

CRITERIA RELATED TO LAND-USE PLANNING	
confirms that the proposed activity is consistent with the IDP?	
Do the reports and information submitted convincingly demonstrate that the proposed activity is **consistent with the SDF of the local authority**?	Yes. The following 0bjectives have been extracted from the Blue Crane Route Municipality SDF (2006) for the Pearston area: 1) Identify land for expansion of industrial investment 2) Expand, support and promote infrastructure upgrading The IDP also identifies local economic development as a priority in Pearston as well as provision of services, of which electricity is a part
Is the proposed development inside or outside an **Urban Edge** in the area in which it is located?	outside
Is there a formal communication from the local authority on record that confirms that the proposed activity is consistent with the SDF, including location in relation to SDF?	Yes, refer to the letter of support from the Blue Crane Route Development Agency inserted below this table
Would authorization of the activity compromise the approved IDP and SDF of the Local Authority?	No, is the development application will assist the municipality if fulfilling priority objectives identified in the IDP and SDF (i.e. local economic development, industrial investment, provision of services, and upgrading of infrastructure

CRITERIA RELATED TO THE NEED FOR THE DEVELOPMENT?	
Do the reports contain a description of the **Need** for the proposed activity?	A socio-economic impact assessment is being done as part of the EIA process. Detailed information from this assessment will be provided in the EIA. There are several benefits of the project including employment creation, social upliftment of the area, provision of clean renewable energy, and assisting the Blue Crane Municipality in meeting their energy demands that has been highlighted as necessary for local economic development in the IDP.
Do the reports demonstrate that the **timing** of the project is appropriate? Is it needed right now, or perhaps rather at some other time in future? [The IDP and SDF is again a guideline for this]	The IDP and SDF (2006) highlight the need for local economic development and service provision.
Do the reports identify alternatives that are feasible and reasonable?	Yes, alternatives are discussed in Chapter 5 of this Scoping Report
Do the reports describe and assess the advantages and disadvantages of the activity or alternatives for the **environment**?	Possible impacts that the activity may have on the environment have been identified in this Scoping Report, and will be assessed in the Environmental Impact Assessment.
Do the reports describe and assess the advantages and disadvantages of the activity or alternatives for the **community** that might be affected by the development?	Possible socio-economic impacts have been identified, and will be assessed in the EIA.

CRITERIA RELATED TO THE NEED FOR THE DEVELOPMENT?	
Do the reports demonstrate that the **community** and/or the local **area and its economy <u>NEED</u>** the activity?	A socio-economic impact assessment is being done as part of the EIA process. Detailed information from this assessment will be provided in the EIA
CRITERIA RELATED TO THE AVAILABLITY OF INFRASTRUCTURE AND SERVICES	
Are the necessary services with appropriate capacity currently available [at the time of application] or must additional capacity be created to cater for the project?	Yes, the project will connect into the existing grid
Is there formal confirmation from the Municipality that services are in fact in place [where relevant and applicable]?	As above
In the case of water services [supply and sanitation], is there formal confirmation from DWAF and/or the Water Services Authority/Provider [as applicable]?	n/a
If services are not in place, is there convincing proof that the development is provided for in local authority infrastructure planning.	n/a
Should the development not be provided for in formal infrastructure planning, is there	n/a

CRITERIA RELATED TO THE NEED FOR THE DEVELOPMENT?	
an assessment of the implications for an impact on future priorities and placement of services?	
Were **ALL** the associated activities that are needed for the project identified and their direct and cumulative impacts assessed?	Yes, a list of activities is given in Chapter 2 of this Scoping Report. Impacts are identified in Chapter 6 and will be assessed in the EIA.

CRITERIA RELATED TO THE DESIRABILITY OF THE PROPOSED DEVELOPMENT	
[Please note that "desirability" is strongly linked to the spatial location of a proposed activity and whether the proposed land-use is appropriate and cost-beneficial. "Desirability" thus relates mainly to the concept of Best Practicable Environmental Option [BOEO]. Desirability is also affected by opportunity costs, while there is also a strong link to cumulative impacts.	
Do the reports submitted in support contain a description of the **Desirability** of the proposed activity?	A town planning report is being done by Urban Dynamics. Their report will discuss the desirability of the application in terms of available spatial planning guidelines. The socio-economic impact assessment will discuss the social and economic benefits/desirability.
Do the reports demonstrate that the proposed activity involves a location of land-use that is either the most beneficial for or the least damaging to the environment as a whole, i.e. **DOES THE LOCATION FAVOUR THE PROPOSED LAND-USE**?	The site was selected because of its proximity to Pearston, which is a small community in dire need of socio-economic uplifment, and because of the existing access and powerlines which negates the need to construct additional infrastructure. The agricultural specialist report concludes that the agricultural potential of the site is relatively low, and that the site is too small to contribute significantly to the economy or food security of the area (or the farm on which they

CRITERIA RELATED TO THE DESIRABILITY OF THE PROPOSED DEVELOPMENT	
	are situated upon).
Do the reports convincingly motivate that the cost and/or disadvantages of the activity to society can be regarded as acceptable?	To be assessed in the EIA and the social impact assessment.
Were the implications and impacts of a No-go Option assessed?	Yes, the No-Go alternative is an alternative that will be considered and assessed in the EIA.
Are there impacts that relate to people's health [noise, odors, vibrations, visual impacts, sense of place, water pollution, waste etc]	Yes, these impacts have been identified for construction and operational phases and will be assessed in the EIA.
If there are significant health impacts, were they adequately addressed in EIA processes and reports?	No health impacts have been identified
Opportunity Cost: Will authorization of the activity have a significant negative impact on other land-use opportunities on or adjacent to the site that might be more beneficial than the proposed activity?	To be assessed in the EIA. This is unlikely since the application is for a solar farm and surrounding land uses are farming. The agricultural specialist report concludes that the agricultural potential of the site is relatively low, and that the site is too small to contribute significantly to the economy or food security of the area (or the farm on which they are situated upon). Based on calculations by the Department of Agriculture, the transformation of the site from grazing land to a solar farm will result in the loss of grazing land for 5 animal units. This is not considered significant.

CRITERIA RELATED TO THE DESIRABILITY OF THE PROPOSED DEVELOPMENT	
Cumulative impacts: Will authorization of the activity lead to unacceptable cumulative impacts?	To be assessed in the EIA – those identified so far include socio-economic and biodiversity impacts

CRITERIA RELATED TO BUSINESS, COMMERCIAL AND COMPETETIVE ISSUES

Explanatory Notes:

1. These criteria relate to situations where the key impact of a development is on the financial viability of other commercial operations in a similar area of commerce. An example would be a situation where a newly authorized filling station may close another to close, thereby leading to job losses and thus a significant negative socio-economic impact on employees and their dependents.

2. Although this issue is not specifically addressed in the National Draft Guideline, the Constitutional Courts has ruled that it **is** an issue that must be considered in EIA Authorizations. This ruling cannot be ignored.

3. It would have been convenient to argue that, once an application has been shown to be consistent with a Local Authority IDP and SDF and the Local Authority has formally supported the activity, it is then implicit that the issue of the economic carrying capacity of the local area for that type of activity has already been considered and that further consideration of the issue is not needed. Unfortunately the Constitutional Court has also ruled that an Environmental Competent Authority must **independently** apply its mind to the matter.

Did the process assess the capacity of the local economy to sustain additional commercial ventures in the field of business and was the issue quantified? If yes, was the study done by a person competent in that field?	To be addressed in EIA
Were the potential adverse economic impacts on other commercial operations in the same field of business assessed in the EIA process and reports? Was such potential impacts quantified?	To be addressed in EIA
Did, in the EIA process, Interested and Affected Parties raise comments and objections on commercial competitive issues? Were such objections addressed by the applicant, the EAP and the Competent Authority?	No issues raised as yet
In the case of an Appeal based on issues of business competition, did the appellants convincingly prove [quantified] their contention that the local economy cannot sustain additional business of that nature and that the authorized development will therefore have significant negative	No appeal has been lodged

socio-economic on themselves and their employees?	
OTHER RELEVANT CRITERIA	
In the case of an Appeal, **were the Appellants registered as IAP's in the EIA process** and, if so, did they raise comments and objections regarding consistency with IDP and SDF?	No appeal has been lodged
Has the EIA process for the development convincingly demonstrated the **financial viability and sustainability** of the project for the applicant?	To be addressed in EIA
In the case of an Appeal, were the Appellants registered as IAP's in the EIA process and, if so, did they raise comments and objections regarding the financial viability and sustainability of the project?	No appeal has been lodged

Letter of support from the Blue Crane Route Development Agency

BLUE CRANE DEVELOPMENT AGENCY

Agriculture
Nico Lombard
082 3294545

Business
Rob Beach
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Tourism
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CEN Environmental
BCRM
Somerset-East
5850

Date: 24/01/2012

Dear Madam

RE: BCDA: Pearston Solar Project: Proposed construction and operation of a 55 MW solar farm and associated infrastructure on Ptn 2 of the Farm Kraan Vogel Kuil No 50 in Pearston

The Blue Crane Development Agency (BCDA) is the development instrument of the Blue Crane Route Municipality (BCRM). The BCDA belongs 100% to the BCRM and was mandated since 2004 to manage all local development in the municipal region.

As part of our project development efforts to realize the economic growth of our region, we are constantly seeking public as well as private development partnerships that will enable the creation of jobs and business opportunities.

BCDA further pledge our support to the Pearston Solar project as a local IDP registered project that is supported by both the council and the BCDA. The project falls within the scope of the SDFP of the municipality.

BCDA appreciates your support.

Regards,

.....

(C. Wilken: Blue Crane Development Agency)

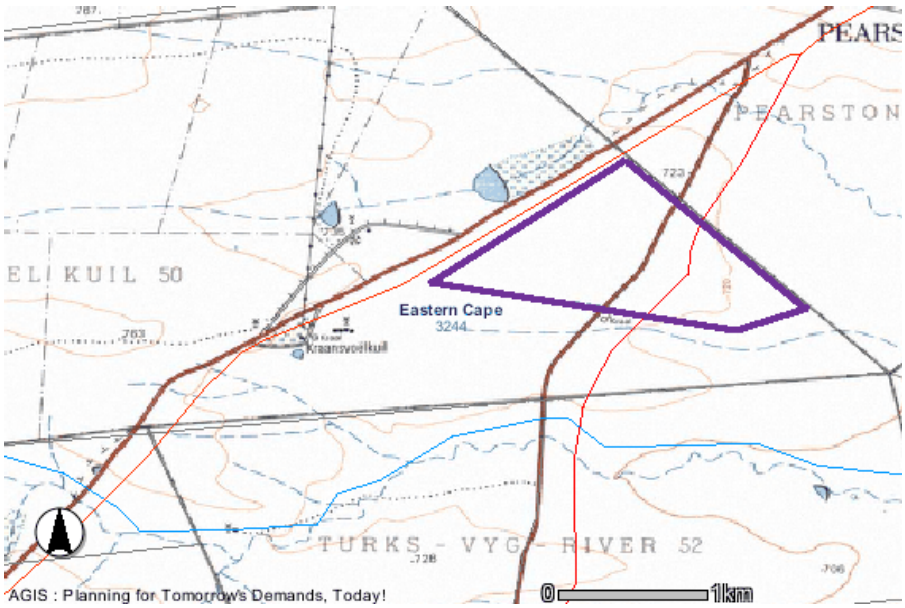
Chapter

4

Chapter 4: The Affected Environment

Topography and Hydrology

The terrain is undulating with low stony ridges and outcrops of plinthite with shallow often gravelly soils interspersed by flats where soils are deeper. No drainage lines intercept these areas, the ground falling off to drainage lines to the south and north (Jacobsen, 2011). The agricultural specialist report noted the importance of the drainage line that occurs south of Areas 3 and 4 (Figure 2) and recommended that no panels must be built within 100 m of this drainage line and that special attention must be paid to stormwater control in these areas.



➢ **Figure 18: An extract of a 1:50 000 topographical map showing the site (outlined in purple) topography (Source: AGIS).**

Geology and Soils (Source: Agricultural Specialist Report – attached as Appendix 3

The geology of the area is characterized by Beaufort Group mudstone and sandstone, as well as dolerite (Vorster, 1985). The soils are generally red to yellow (Fb & Ag soil patterns – Dept. Agric., 1991), are well drained, structureless (apedal), with a high base status and underlain by weathered rock. These relatively shallow soils (<300mm on the hills, ridges and aprons to 1000mm in the floodplains, plains and water courses) (Dept. Agric., 1991) occur in arid to semi-arid areas associated with low rainfall (<500mm per annum). A wide range of textures may occur (usually loamy to sandy loam). Stones or rocks are often present on the soil surface. The main soil forms are Hutton, Glenrosa and Mispah. (AGIS Website, Dept. Agric., Fisheries & Forestry – www.agis.agric.za).

Climate

The regional climate of the Blue Crane Route Municipality (BCRM) is moderate with hot summer days and cooler winter nights and is characterized by low humidity and medium to low unpredictable and variable rainfall mostly in late summer months.

Weather data was collected from the Somerset East Hospital weather station (station number 0076134A4) for the period of 28 years. The weather station is located at 32º 44' South and 25º 35' East, at a height of 717 meters above mean sea level.

4.1.1 Rainfall

Winter cold fronts bring rain to the south, especially over the Zuurberg Mountains and occasional snow to the Coetzee's and Boschberg Mountains in the north, while the Karoo plains between Zuurberg and Somerset East are in rain shadow. Somerset East rain falls mainly in summer (October to March) with a peak February and March. Fog occurs occasionally over the

mountains, especially in summer over the Boschberg Mountain (BCDA, 2010). Table 1 indicates the total amount of rainfall recorded on a monthly basis for Somerset East (1970 - 2005).

- **Table 1: Mean Monthly Rainfall Data (mm) for Somerset East**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
48	75	84	42	28	21	25	41	30	57	61	58	570

4.1.2 Temperature

The mean annual temperature recorded for Somerset East is 17.2 °C. Table 2 indicates average daily temperatures recorded for the Somerset East Area from 1961 to 1990. Table 3 shows average minimum and maximum monthly temperatures recorded for Somerset East from 1957 to 2002.

Daytime temperatures reach a maximum of 30º C in summer, and a mean of 19 ºC in winter months, with a yearly average of 24.2 ºC. A maximum temperature of 42.4 ºC has been recorded to date. Sunny days are more frequent in winter when the humidity drops, however frost can occur for several days during cold fronts (BCDA, 2010). The average daily minimum temperatures range from 6º C in June to 15.0 ºC in February with a yearly average of 10.2 ºC. Several subzero temperatures are likely between middle May and the beginning of September ranging between -1.6 ºC and -3.8 ºC. A minimum temperature of -3.8 ºC has been recorded to date.

- **Table 2: Average of Daily Temperatures (ºC) Recorded for the Somerset East Area During the Period 1961 to 1990**

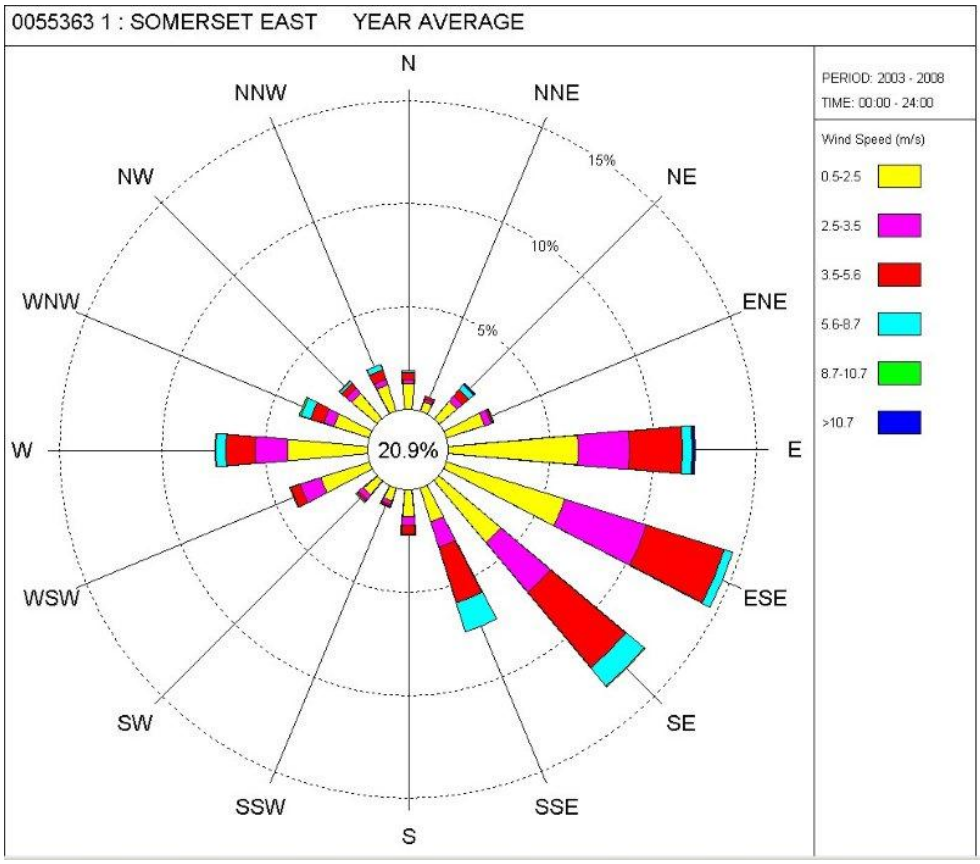
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Ave. Daily Temp	22.2	21.9	20.3	17.4	14.7	12.6	12.6	13.5	15.1	16.7	18.7	20.9	17.2

- **Table 3: Average minimum and maximum monthly temperatures (ºC) recorded for Somerset East (1957 – 2002)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min	14.7	15.0	13.8	10.8	8.0	6.0	5.7	6.5	7.9	9.6	11.5	13.2
Max	29.6	28.7	26.8	24.1	21.5	19.2	19.4	20.6	22.4	23.8	26.0	28.5

4.1.3 Wind

Winds are predominantly from the east-south-east to east and are quite frequently strong reaching speeds of 8.7 m/s. Calm periods are most frequent early morning and during March to July. Summer months, September through to April, are dominated by south-east to easterly winds reaching speeds of 8.7 m/s. During winter months the wind direction is dominated by westerlies reaching speeds up to 10.7 m/s and more. Figure 19 is a wind rose for Somerset East for the period 2003 – 2008 (Source: S.A. Weather Bureau).



- **Figure 19: A Wind Rose for the Somerset East Area (Source: S A Weather Bureau)**

Biodiversity

4.1.4 Classification of Vegetation and Ecosystem Status

Various authors have classified the vegetation and ecosystem and/or conservation status of the study area. The most frequently used classification systems will be presented below:

4.1.4.1 National Scale

Mucina and Rutherford (2006)

According to the national classification of vegetation types, vegetation on site is Eastern Lower Karoo (Figure 20). The conservation status of the vegetation type is least threatened, however it is hardly protected.

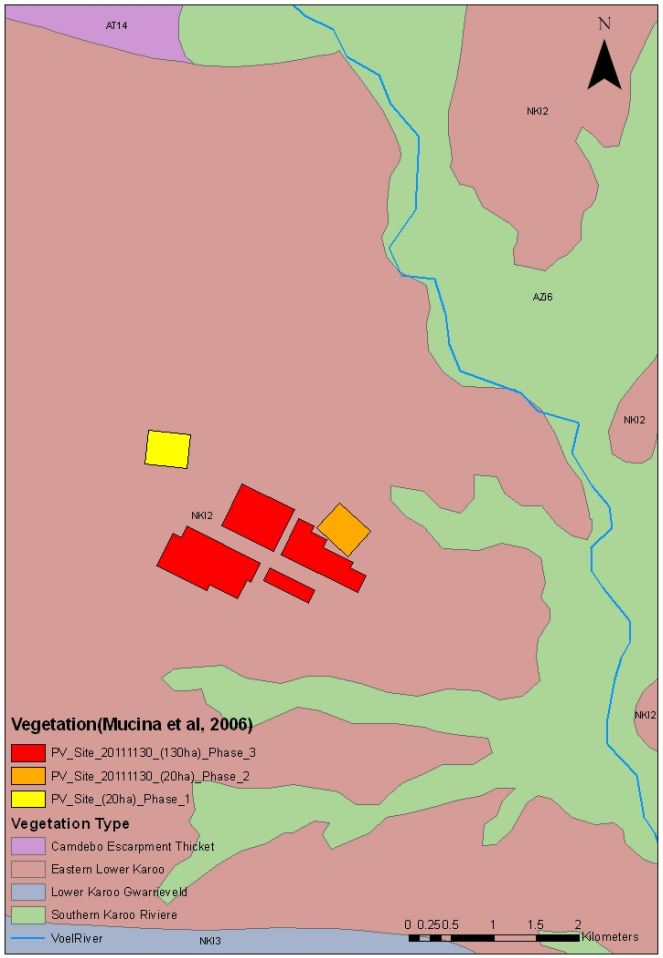
Eastern Lower Karoo occurs on plains interrupted by some dolerite dykes, butts and mesas. The dominating vegetation is low to middle-height microphyllous shrubland with drought-resistant 'white' grasses becoming abundant in places, especially on sandy and silty bottomlands. Leaf-succulent dwarf shrubs of the families Aizoaceae and Crassulaceae can also be encountered. Important taxa include the following:

- **Endemic taxa**: *Aloinopsis rubrolineata, Chasmatophyllum nelii, Cylindrophyllum calamiforme, Euphorbia coerulans, Ruschia vanderbergiae, Haworthia decipiens var. cyanea* and *Haworthia greenii.*
- **Small trees**: *Acacia karroo*.
- **Tall shrubs**: *Lycium cinereum, Lycium oxycarpum, Cadaba aphylla*, *Carissa haematocarpa, Grewia robusta, Lycium schizocalyx* and *Rhigozum obovatum.*
- **Low shrubs**: *Eriocephalus ericoides subsp. ericoides, Felicia muricata, Pentzia incana, Rosenia humilis, Aptosimum elongatum, Asparagus striatus, Asparagus suaveolens, Barleria pungens, Blepharis capensis, Blepharis mitrata, Chrysocoma ciliata, Euryops anthemoides, Galenia secunda, Garuleum latifolium, Helichrysum zeyheri, Hermannia cuneifolia, Indigofera sessilifolia, Limeum aethiopicum, Microloma armatum, Pegolettia retrofracta, Phymaspermum parvifolium, Plinthus karooicus, Polygala seminuda,Pteronia adenocarpa, Pteronia glauca, Pteronia sordida, Selago fruticosa, Senecio acutifolius, Sutera halimifolia* and *Zygophyllum microphyllum.*
- **Succulent shrubs**: *Ruschia cradockensis subsp. cradockensis, Astroloba foliolosa, Crassula corallina, Drosanthemum lique,Drosanthemum subspinosum, Euphorbia ferox, Mestoklema tuberosum, Pachypodium succulentum, Rhombophyllum nelii, Sarcocaulon camdeboense, Sarcocaulon patersonii* and *Trichodiadema barbatum*.
- **Semiparasitic shrubs**: *Thesium hystrix*.
- **Herbs:** *Chamaesyce inaequilatera, Convolvulus sagittatus, Gazania krebsiana, Lepidium africanum subsp. africanum* and *Tribulus terrestris.*

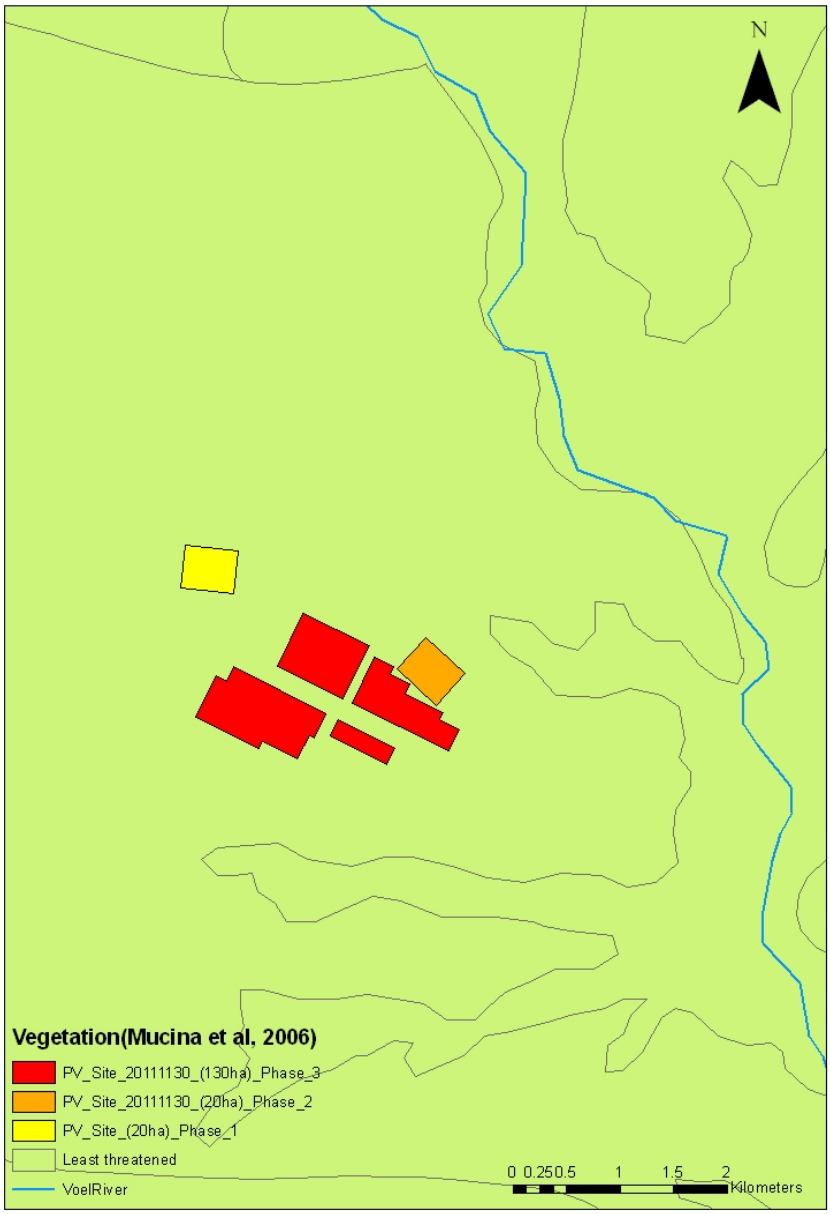
- **Geophytic herbs**: *Albuca setosa, Drimia anomala, Drimia intricata* and *Moraea polystachya*.

- **Succulent herbs**: *Crassula muscosa, Psilocaulon articulatum, Psilocaulon coriarium* and *Senecio radicans*.

- **Graminoids:** *Aristida adscensionis, Aristida congesta, Eragrostis lehmanniana, Eragrostis obtusa, Tragus berteronianus, Tragus koelerioides, Tragus racemosus, Aristida diffusa, Chloris virgata, Cynodon incompletus, Enneapogon desvauxii, Eragrostis curvula* and *Stipagrostis obtusa.*



➢ **Figure 20: Vegetation Type according to Mucina and Rutherford (2006) (site shown by red blocks).**



- **Figure 21: Conservation status of the area according to Mucina and Rutherford (2006) (least threatened) (site shown by red blocks).**

4.1.4.2 Regional Scale

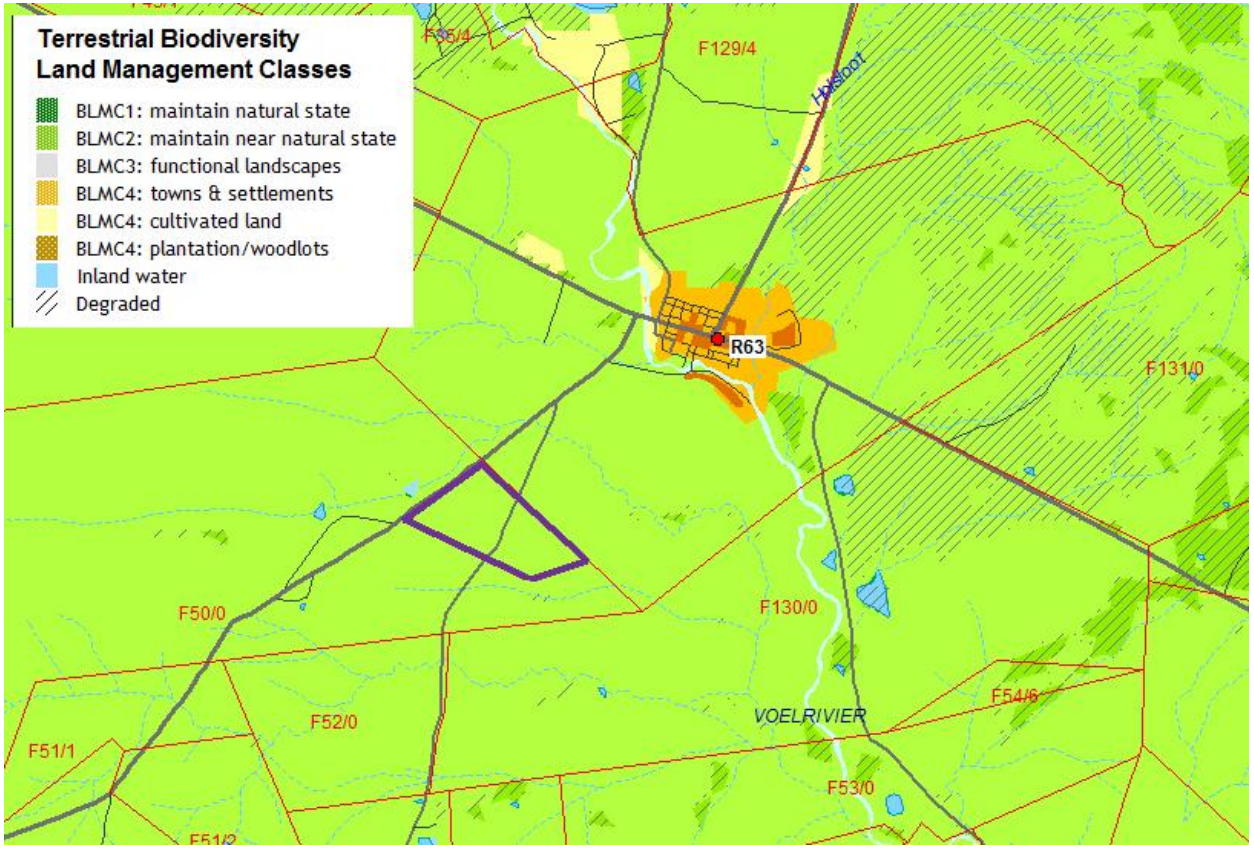
East Cape Biodiversity Conservation Plan (ECBCP) (Figure 22)

The ECBCP (2007) classifies various parcels of land into Broad Land Management Classes (BLMC) broadly depending on their transformation

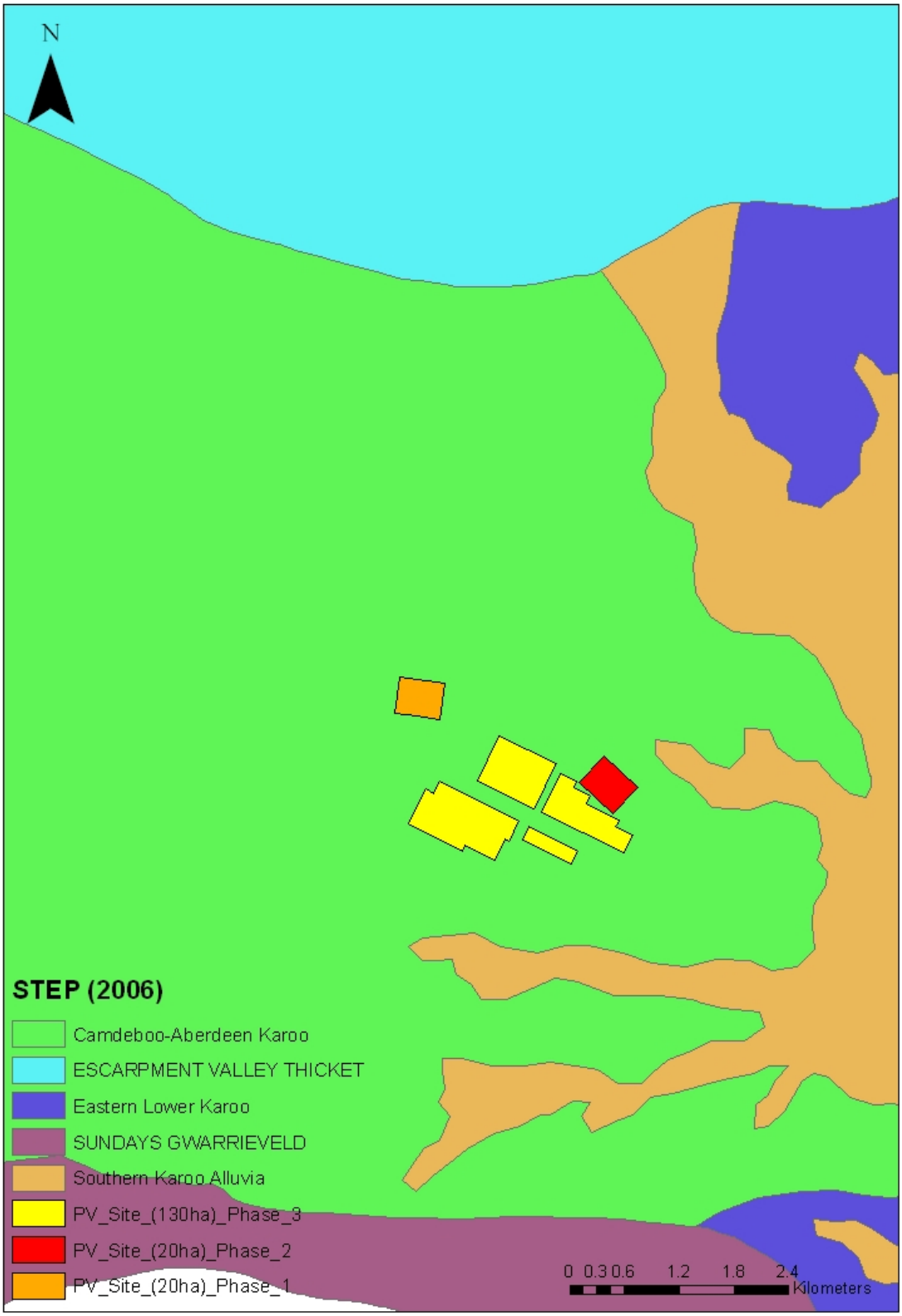
status and ecological function. The site falls into a BLMC2 category (Figure 22). This implies that the site should be maintained as near natural state and sensitive development should only be allowed in degraded areas.

Subtropical Thicket Ecosystem Plan (STEP)

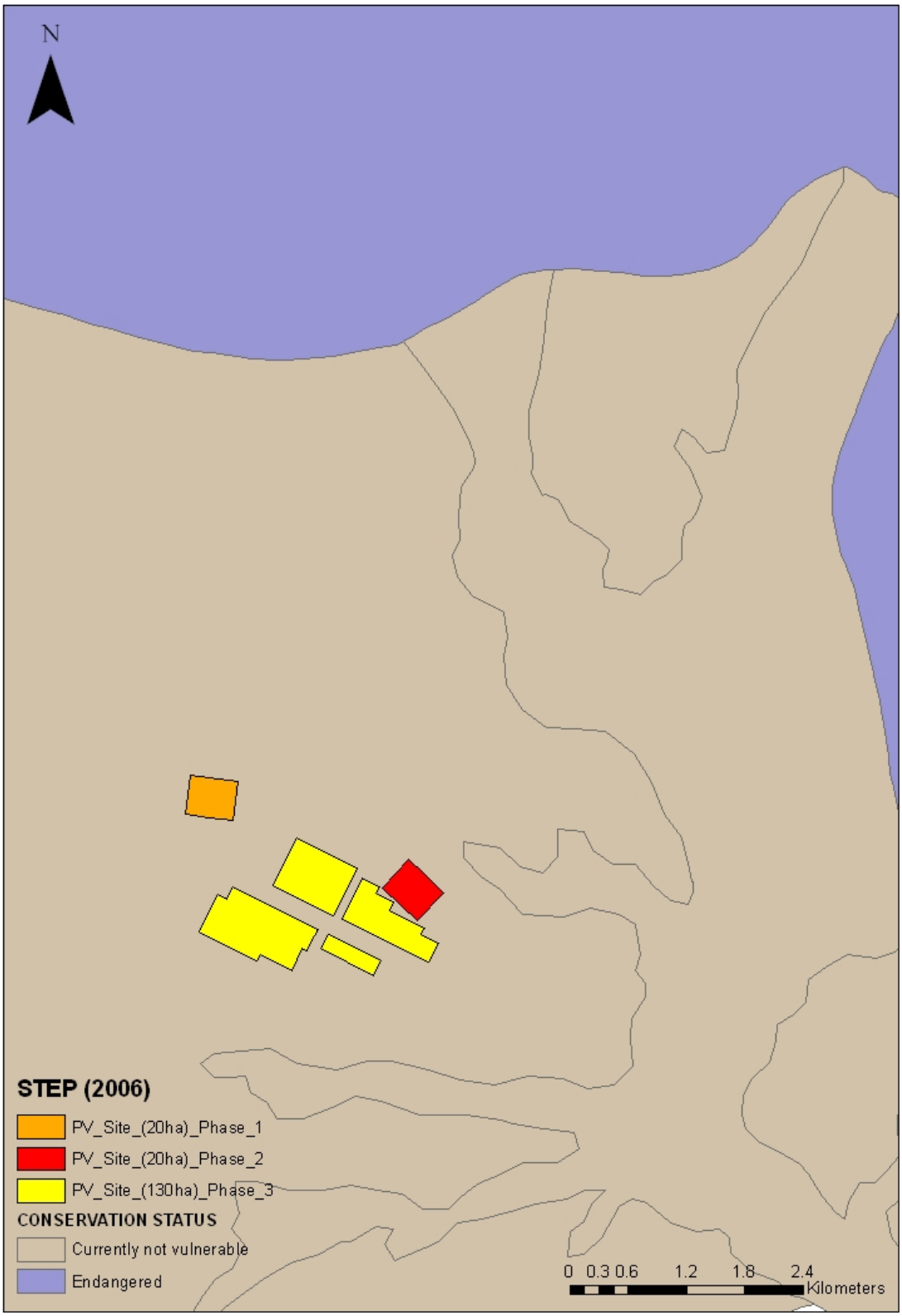
According to the STEP (2006), vegetation on site is classified as Camdeboo-Aberdeen Karoo (Figure 23). Camdeboo-Aberdeen Karoo consists of dense karoo overwhelmingly dominated by ankerkaroo (*Pentzia incana*). Other shrubs include doringkapokbos (*Eriocephalus spinescens*), pleisterbos (*Hermannia* spp.) and doublaarvygies (*Drosanthemum* spp.). Grasses (*Aristida* spp. and *Eragrostis* spp.) may be conspicuous after good rains. Camdeboo-Aberdeen Karoo is classified as 'Least threatened' (Figure 24). There are no megaconservancy networks that traverse the site (Figure 25)



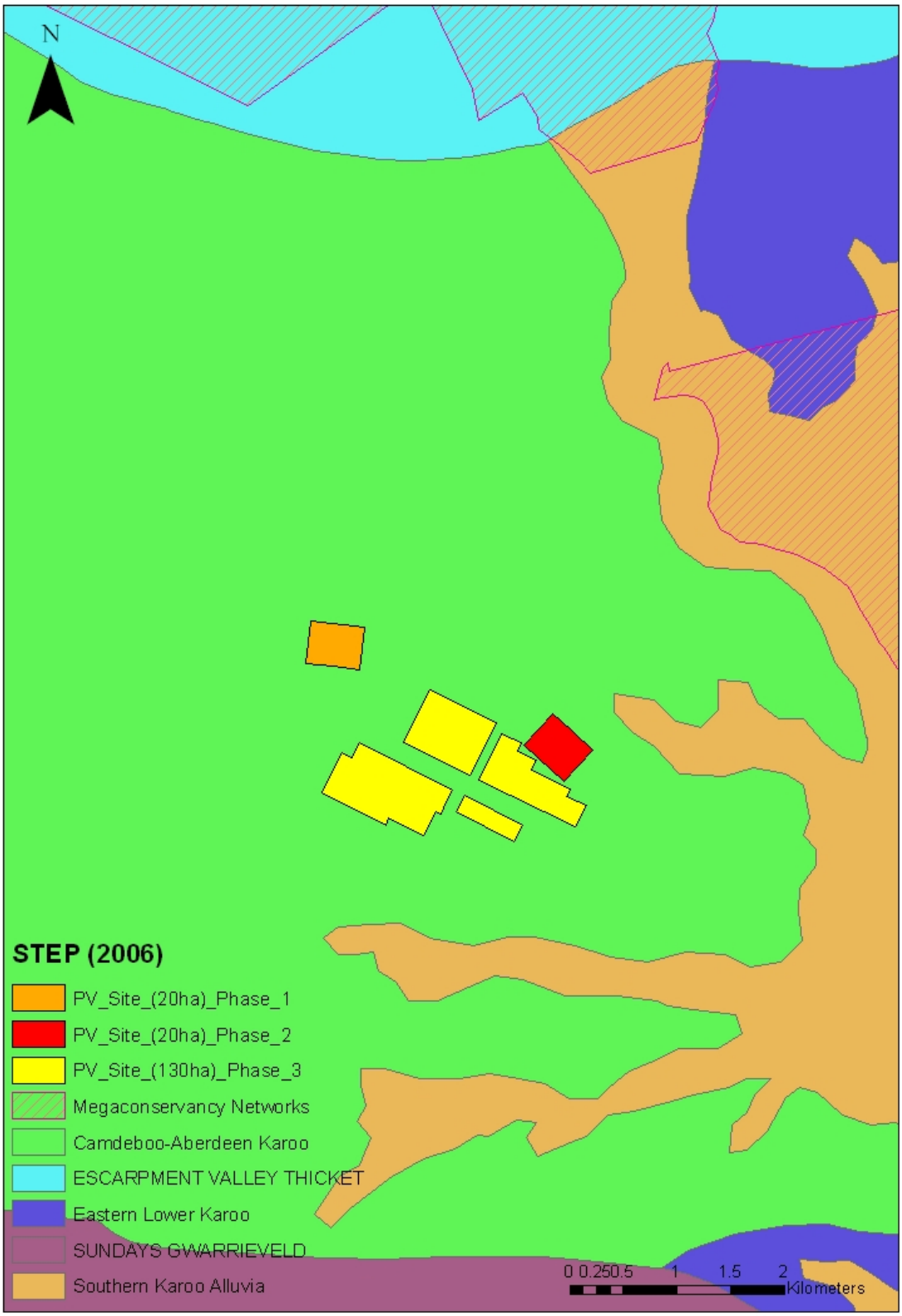
➢ **Figure 22: Figure indicating the Land Management Classes of the site (relative location in purple) (ECBCP, 2007).**



- **Figure 23: Vegetation on site (yellow blocks) is classified as 'Camdeboo-Aberdeen Karoo' according to STEP (2006).**



- **Figure 24: The conservation status of the site (yellow blocks) is reated as 'currently not vulnerable' (STEP, 2006).**



- **Figure 25: There are no megaconservancy networks that traverse the site (yellow blocks) (STEP, 2006).**

4.1.5 Site-specific Biodiversity description (Source: Jacobsen, 2011 – attached as Appendix 4)

4.1.5.1 Vegetation

A list of floral species recorded on site is given in Table 1 in Appendix 4.

Although the vegetation of the area is has been disturbed it still exhibits substantial species richness. The vegetation has been subjected to overgrazing with the result that species composition has changed from its original state. This is manifest in the bare areas occurring between vegetation tufts and clumps and the paucity of perennial grasses and the abundance of annual and perennial sour grasses. Some of these such as *Aristida congesta* and *Tragus koelerioides* are ruderals, increasing under disturbed conditions. Sheet erosion is present throughout the area although most evident away from rocky and gravelly soils, promoting pedestal development and the presence of flow lines. Area 4 appears to have the best soil cover while areas 1 and 3 are the poorest.

The number of species recorded for three of the sites is similar despite the small size of Area 3, but was substantially more for Area 4. This could be ascribed to the larger area of the latter despite the vegetation and topography appearing superficially similar. This is substantiated by the far larger number of species (13) only recorded at the latter. However Area 3 stands out as having disproportionately higher species richness than the other sites.

Acocks (1975) regarded the vegetation type of the Camdebo plains as Veld Type 37, False Karroid Broken Veld, a poor derivative of the original vegetation cover of an open grassy shrub savanna, marginal to Spekboomveld and scrub of the lower mountain slopes as a result of having been invaded by Central Lower Karoo and Karroid Broken Veld, following erosion after the destruction of the grass cover. Although this may have affected plant species richness, what remains is still substantial.

The area falls within the Albany Centre of Endemism (Van Wyk & Smith 2001) rich in endemic succulents and non-succulents, some of which have been recorded in the

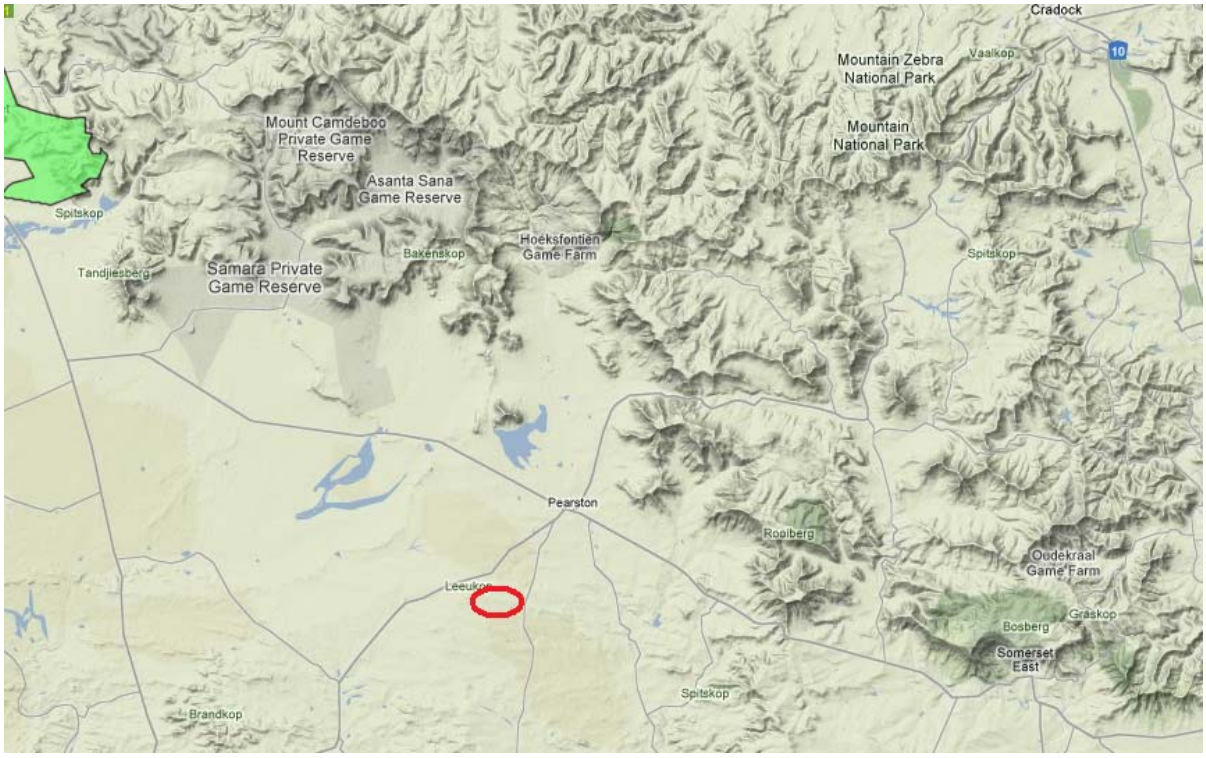
areas surveyed. These include *Euphorbia ferox, Rhombophyllum* sp*., Mestoklema tuberosum, Cyrtanthus helictus, Drimia anomala* and *Duvalia modesta*. Two forms of the *Crassula capitella* complex also appear to be endemic and may represent undescribed forms or species, while the occurrence of what appears to be *Duvalia parviflora,* is a new record for the Eastern Cape and far removed from the nearest record in the Little Karoo between Ladismith and Oudtshoorn. It is listed as Vulnerable in the Red List of South African Plants 2009 (Raimondo *et al* 2009) due to habitat loss from agricultural practices.

4.1.5.2 Fauna

A list of fauna recorded or that are likely to occur on site are given in Tables 2 to 4 in Appendix 4.

The fauna of the area appears to be poor, in part perhaps due to anthropogenic activities such as predator control. Few species were recorded but many others are expected to occur or be transient through the areas. Few rare and threatened species are present, these limited to the avifauna. Species which will be most affected are Blue Crane which were recorded foraging adjacent to Area 3, as well as Ludwig's Bustard. It was also noticed that the current powerlines are not fitted with avian avoidance devices, which may have resulted in mortalities of both these species, in particular the latter. According to Barnes (2000) these pose the most serious threat to these species in the eastern Karoo resulting in a mortality rate of one bird/ km/ annum in the case of Ludwig's Bustard. It is imperative that appropriate marking devices be put in place as well as on any new distribution and transmission lines which may arise from the development.

The site is not part of the list of internationally important bird areas (BirdLife International) (refer to Figure 26).



- **Figure 26: The site is not part of the list of international important bird area (BirdLife International).**

Air Quality

Air quality in the area is expected to be good since there is very little activity other than farming, which is mostly grazing animals. There are no major industries nearby and vehicular traffic on the surrounding road network is relatively low.

Noise

There is very little noise in the surrounding area. Currently, the only potential sources of noise nearby the site are from farm vehicles on gravel roads.

Sites of Archaeological and Cultural Interest

A Phase 1 Archaeological Impact Assessment has been done by Dr Johan Binneman (report attached as Appendix 5). The study concluded that the site is of

low archaeological sensitivity and that the development may proceed as planned. The following recommendations were made:

- No solar panels must be constructed within 20 metres of the concentration of Later Stone Age stone tools (GPS reading: 32.36.019S; 25.06.379E).
- If any concentrations of archaeological material are uncovered during development, it should be reported immediately to the Albany Museum and/or the South African Heritage Resources Agency.
- Construction managers/foremen should be informed, before construction starts, on the possible types of heritage sites which may be encountered during construction.

Regional Socio-Economic Structure

Most of the data presented below was extracted from Census data for 2006. Where this data was not available in 2006, or where more recent data was available for selected indicators, this is indicated in the relevant sections. All figures apply to the Eastern Cape.

Table 4 shows the percentage of the total population residing in each of the provinces from 2001 to 2006. The last column in Table 4 shows shifts in population size based on the new provincial boundaries announced in January 2006. The results show that the Eastern Cape has the third largest population in South Africa.

- **Table 4: Provincial population numbers (Stats SA, 2006)**

Province	2001	2002	2003	2004	2005	2006	2006 (New boundaries)
Eastern Cape	15,5	15,4	15,2	15,1	15,0	14,9	14,6
Free State	6,5	6,4	6,4	6,3	6,3	6,2	6,2
Gauteng	18,5	18,7	18,9	19,0	19,2	19,4	20,1
Kwazulu-Natal	20,7	20,7	20,7	20,6	20,6	20,5	20,9
Limpopo	12,3	12,2	12,1	12,1	12,0	12,0	11,3
Mpumalanga	6,9	6,9	6,9	6,9	6,9	6,9	7,4
Northern Cape	1,9	1,9	1,9	1,9	1,9	1,9	2,3
North West	8,2	8,2	8,2	8,2	8,2	8,1	7,1
Western Cape	9,4	9,5	9,7	9,8	9,9	10,0	10,0
Total	100	100	100	100	100	100	100

Table 5 shows the detailed provincial mid-2006 population estimates by age and sex.

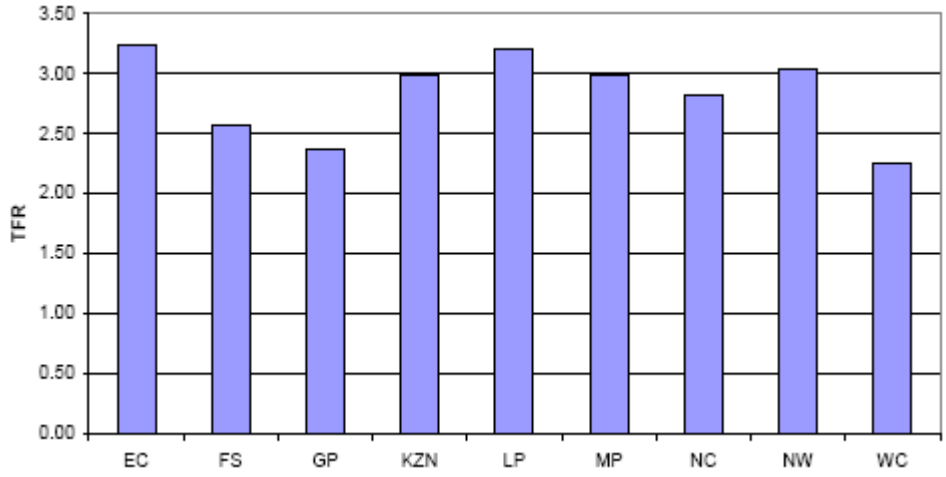
- **Table 5: Provincial mid-2006 population estimates by age and sex (Stats SA, 2006).**

Age	Male	Female	Total
0-4	391 800	389 900	781 700
5-9	393 800	385 800	779 600
10-14	454 600	447 100	901 700
15-19	440 300	433 300	873 600
20-24	347 200	351 800	699 000
25-29	258 500	267 400	525 900
30-34	205 400	230 100	435 500
35-39	148 300	183 000	331 300
40-44	128 600	170 200	298 800
45-49	128 000	172 500	300 500
50-54	109 900	146 600	256 500
55-59	89 200	120 900	210 100
60-64	83 700	111 000	194 700
65-69	75 400	109 700	185 100

Age	Male	Female	Total
70-74	55 500	78 200	133 700
75-79	32 900	47 300	80 200
80 +	23 600	40 000	63 600
Total	3 366 700	3 684 800	7 051 500
Total (new provincial boundaries)	3 294 900	3 599 400	6 894 300

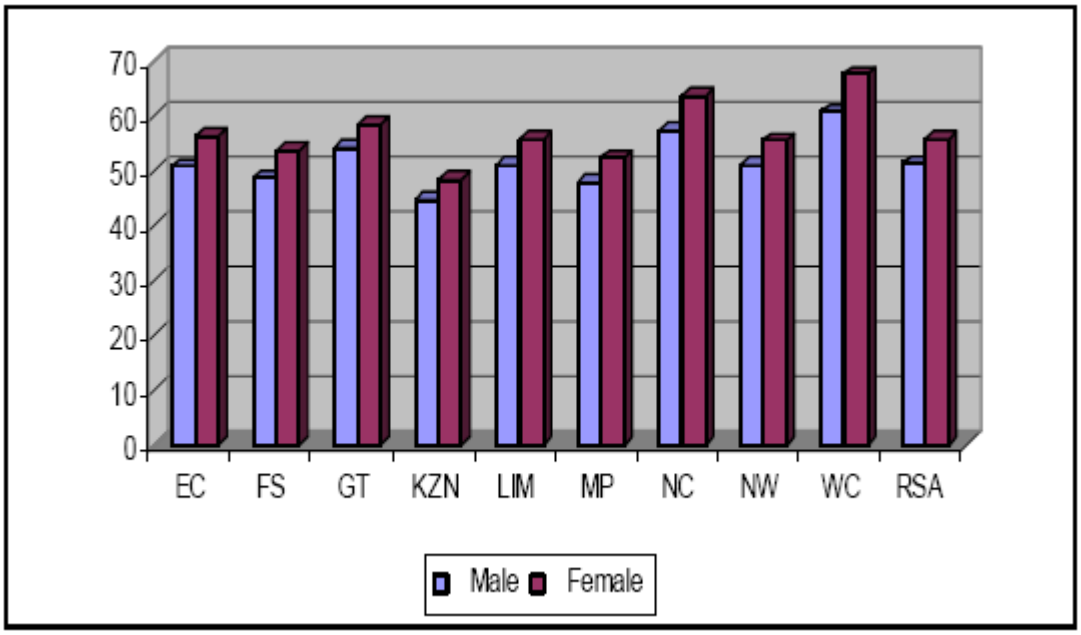
In 2001, the percentage of people in the Eastern Cape living in rural and urban areas was 61.2 and 38.8 % respectively.

Figure 27 shows the total fertility rates (TFR) by province for the period 2001 to 2006. The Eastern Cape and Limpopo provinces have the highest fertility levels.



- **Figure 27: Provincial Fertility Rates (2001 – 2006) (Stats SA 2006).**

Figure 28 shows the average provincial life expectancies at birth for males and females for the period 2001 to 2006.



- **Figure 28: Life expectancies at birth for males and females (2001 – 2006) (Stats SA, 2006).**

An analysis of internal migration streams showed that the Eastern Cape and Limpopo provinces had the highest outflow of people.

The percentage of the Eastern Cape population over the age of 20 years that had no schooling in 2006 was 12.4.

The most frequently spoken language in the Eastern Cape is isiXhosa (83.4%), followed by Afrikaans (9.3%) and English (3.6%) (Stats SA, 2001).

4.1.6 Human Development Index

The level of human development in a country or region is measured by people's freedom to choose and act upon their choices. In order to make informed choices, people must have some basic human capacities, and a reasonable range of opportunities. The Human Development Index developed by the United Nations Development Programme (UNDP) uses life expectancy and adult literacy as an indication of people's capacities, while income is used to suggest the opportunities available to them (Erasmus 1994). The HDI ranges from 1 (the maximum level of

development) to 0 (a low level of development). In 1991 the HDI for South Africa was 0.67, typical of a developing country.

The HDI for the Eastern Cape was 0.643 in 1996, and is projected to be 0.493 and /or 0.698 (with or without the effect of AIDS) in 2010 (Health Systems Trust, 2008).

4.1.7 Major Economic Activities and Sources of Employment

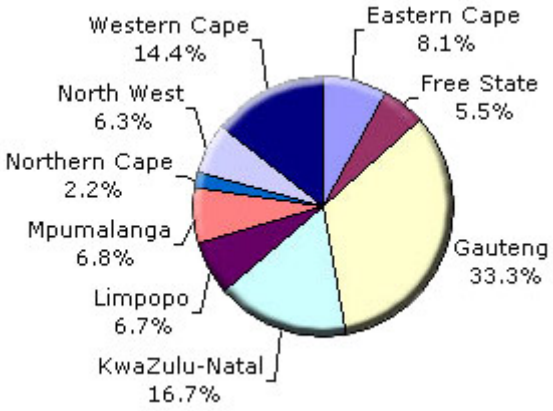
4.1.7.1 Unemployment Estimate for the Eastern Cape

The official definition of the unemployed is that they are those people within the economically active population who (a) did not work during the 7 days prior to the interview, (b) want to work and are available to work within a week of the interview, and (c) have taken active steps to look for work or to start some form of self-employment in the 4 weeks prior to the interview. The expanded definition excludes criterion (c). It therefore includes discouraged work seekers who have failed to take active steps to obtain employment in the 4 weeks prior to the interview. In 2007, the official unemployment rate was estimated as 23.1% and in 2004 the expanded unemployment rate was estimated as 50%. In 2006, the age dependency ration of the Eastern Cape was calculated as being 70. This means that for every 100 economically active people, there are 70 that need to be supported (National Health Trust, 2008).

4.1.8 Commercial activities surrounding the proposed development site

There are very few commercial activities in the surrounding area, the predominant activity being farming. The Integrated Development Plan for the BCRM has identified local economic development initiatives as a priority.

The Eastern Cape contributes 8.1% to the total GDP of South Africa (Figure 29).



- **Figure 29: Contribution by province to the GDP of South Africa (Stats SA).**

Socio-Economic status of the Blue Crane Route municipality (data below is extracted from the BCRM Spatial Development Framework, 2006)

The estimated population size in the BLCRM in 2004 was 36 177, and the projected population of the area by 2010 was nearly 40 000. The increase in population has a significant influence on service delivery, provision of affordable housing, education, health facilities and infrastructure.

Sixty-four percent of people in the BCRM fall in the economically activity age group (i.e. 15 to 64 years), indicating a high level of employment eligibility. However, of the entire Blue Crane Route population a mere 35% of the economically active population is employed and over 40% is not economically active. This puts a great amount of pressure on the employed population to support those that are not employed or economically active and creates a large dependency ratio on the employed percentage. The unemployment rate in the area is approximately 24%, made up of scholars/students (19%), homemakers/housewives (9%), pensioners (10%), the medically unfit (7%), seasonal workers not currently employed (1%); those who choose not to work (3%) and those that could not find work (50%). The highest numbers of people are employed in the agricultural sector (36% in 2004).

Just over 15% of the population in Blue Crane Route has a matric or matric and higher qualification, however approximately 20% of individuals have no schooling whatsoever, which means that 1 out of every 5 people in the Blue Crane Route

Municipality has no education, while a further 27% have some primary education. The relatively low levels of education in Blue Crane Route Municipality reflect the need for education facilities.

Pearston is the third urban node located within the Blue Crane Route Spatial Development Framework. The urban area is rated as a secondary node due to its urban function and size. Approximately 4176 people reside in the three residential areas of Pearston. The town serves as a centre of urbanisation for surrounding rural farming communities. The majority of households moving and residing the Pearston are poor and without adequate income opportunities. Limited new investment and development is prevalent in the urban area.

Legislation and guidelines taken into account

The following were taken into account in the scoping phase:

- National Environmental Management Act (Act No. 107 of1998)
- National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004)
- National Environmental Management Act: Waste Act (Act No 59 of 2008)
- National Environmental Management Act: Air Quality Act (Act No 39 of 2004)
- Environmental Conservation Act (Act No. 73 0f 1989)
- National Water Act 36 of 1998
- Physical Planning Act 125 of 1991
- National Heritage Resources Act 25 of 1999
- National Agricultural Act 70 of 1970
- Environmental Impact Assessment Regulations (2010)
- Guidelines published to assist with interpretation of the EIA Regulations (2006 and 2010)

Chapter

5

Chapter 5: Project Alternatives

5.1.1 The 'no-go' option

The no-go alternative assumes the status quo remains – i.e. the site is used for stock grazing purposes.

According to CARA (Conservation of Agricultural Resources Act 43 of 1983) the official carrying capacity for the area is 17 ha per large stock unit. CARA seeks to provide for the conservation of natural agricultural resources by maintaining the production potential of land, combating and preventing erosion and weakening or destruction of water resources, protecting vegetation and combating weeds and invader species. According to Veld types of South Africa by J.P.H Acocks the site falls in zone no. 31 (Succulent karoo) that consists mainly of short karoo bushes, succulent plants, scrubs and grasses. The estimated area needed for the 55 MW plant will is ± 138 ha which will mean a loss of only 8.1 Large Stock Units or 54 Small Stock Units. It will not be a total loss as this area can still be utilized by sheep. The solar plant will be fully compatible with veld management systems where they are farming with sheep. The intervention of the solar plant will be minimal (extracted from a letter of support for the project written by the Eastern Cape Department of Agriculture, Rural Development and Agrarian Reform – Mr A Snyman).

The Integrated Development Plan for the Blue Crane Route Municipality highlights the need for energy and the upgrading of electrical infrastructure, as well as local economic development. The proposed solar farm will contribute to meeting these needs. Significant employment opportunities are expected in construction and operational phases. The applicant proposes to supply alternative energy to local schools and provide financial aid through educational scholarships to the local community. The solar farm project is a registered project in the municipalty's Integrated Development Plan and is supported by the municipality and the Blue Crane Route Development Agency.

Mucina and Rutherford (2006) classify the vegetation type as Eastern Lower Karroo which is considered to be least threatened and there are no megaconservancies that traverse the site according to the regional Subtropical Thicket Ecosystem Plan (STEP). However, the site is classified as a Broad Land Management Class 2 in the East Cape Biodiversity Conservation Plan which implies that the site is suited for limited development in non-sensitive areas, and should ideally be maintained in a near-natural state. The site is currently farmed and although substantial floral species richness still occurs, vegetation has been transformed from its original status and overgrazing is evident.

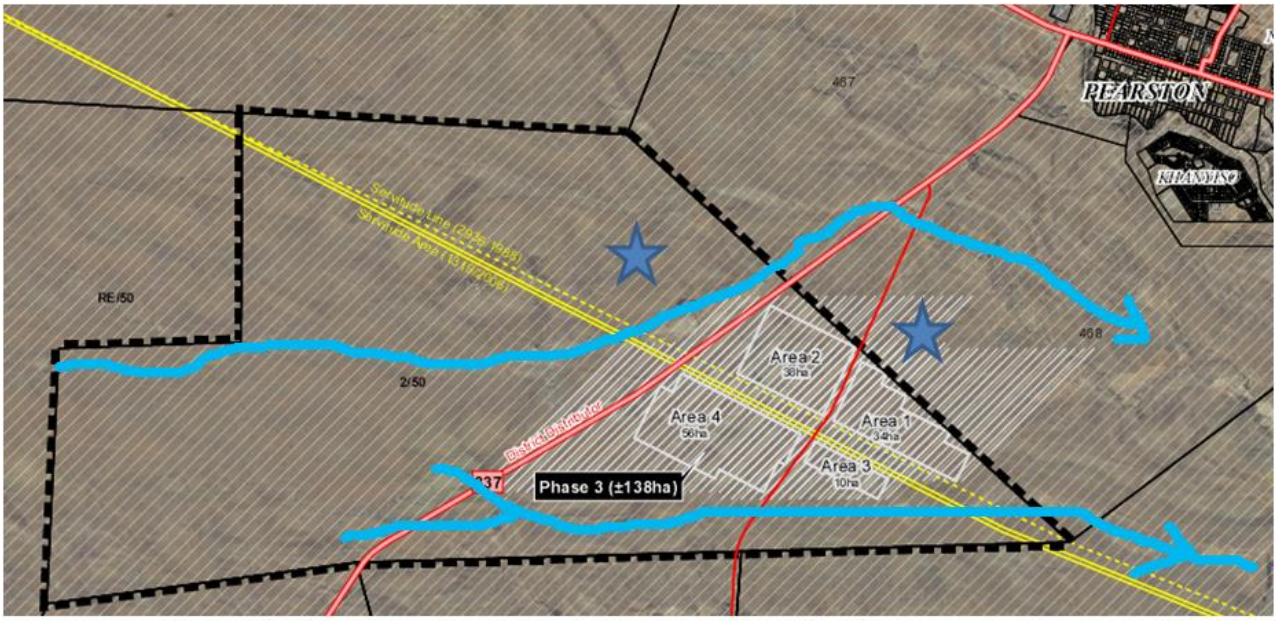
It is therefore believed that the site and project activity are not fatally flawed from consideration and assessment for the proposed solar farm. The 'no-go option will however be used as a baseline throughout the assessment process against which potential impacts will be compared in an objective manner.

5.1.2 Site alternatives

As a starting point, the applicant considered various aspects to determine a suitable location for a solar farm in the Pearston area including, but not limited to, irradiation levels, the distance to the power grid, site accessibility, founding conditions, fire risk and current land uses. The Farm Kraan Vogel Kuil just west of Pearston met these criteria. A 10 MW solar farm has been approved north of the R337 in the north-eastern portion of the farm and an application has been submitted for a second 10

MW solar farm on commonage land directly east of and adjacent to the proposed site for this application (refer to blue stars in Figure 30).

The selected farm was then scanned and aspects such as hydrology, sensitive vegetation and other habitats, and proximity to existing infrastructure were used to determine the selected areas (i.e. Area 1 to 4 as shown in Figure 30). The selected blocks are adjacent to existing powerlines and are close by to the approved 10 MW solar plant north of the R337 and the proposed plant east of the site, providing opportunities of shared infrastructure and increased efficiency. Drainage features (blue lines in Figure 30) were also avoided. A Level 1 Archaeological Impact Assessment was done for the selected area and the specialist concluded that it is of low cultural sensitivity and that development can proceed as planned. The archaeological specialist noted panels must be constructed within 20 metres of the concentration of Later Stone Age stone tools (GPS reading: 32.36.019S; 25.06.379E) (refer to Appendix 5). An ecological specialist report was done of the selected area. The vegetation has been subjected to overgrazing with the result that species composition has changed from its original state. However, the area still exhibits substantial floral species richness, and a single occurrence of a threatened species, *Duvalia parviflora*, was recorded. The location of this species, and others that were not found in large numbers in the area (e.g. *Aloe longistyla, Astroloba foliolosa, Haworthia nigra, Duvalia* sp. cf *parviflora, Adromischus subdistichus, Aloe claviflora*) was demarcated using a hand-held GPS and indicated on a map to the applicant to be protected with a 10 m buffer around each recording. The agricultural specialist (report attached as Appendix 3) recommended that no panels or other development occur within 100 m of the drainage line that occurs south of Area 3 and 4 (refer to blue line in Figure 30). These recommendations were given to the applicant to use in the preferred layout plan. This will be presented in the EIA.



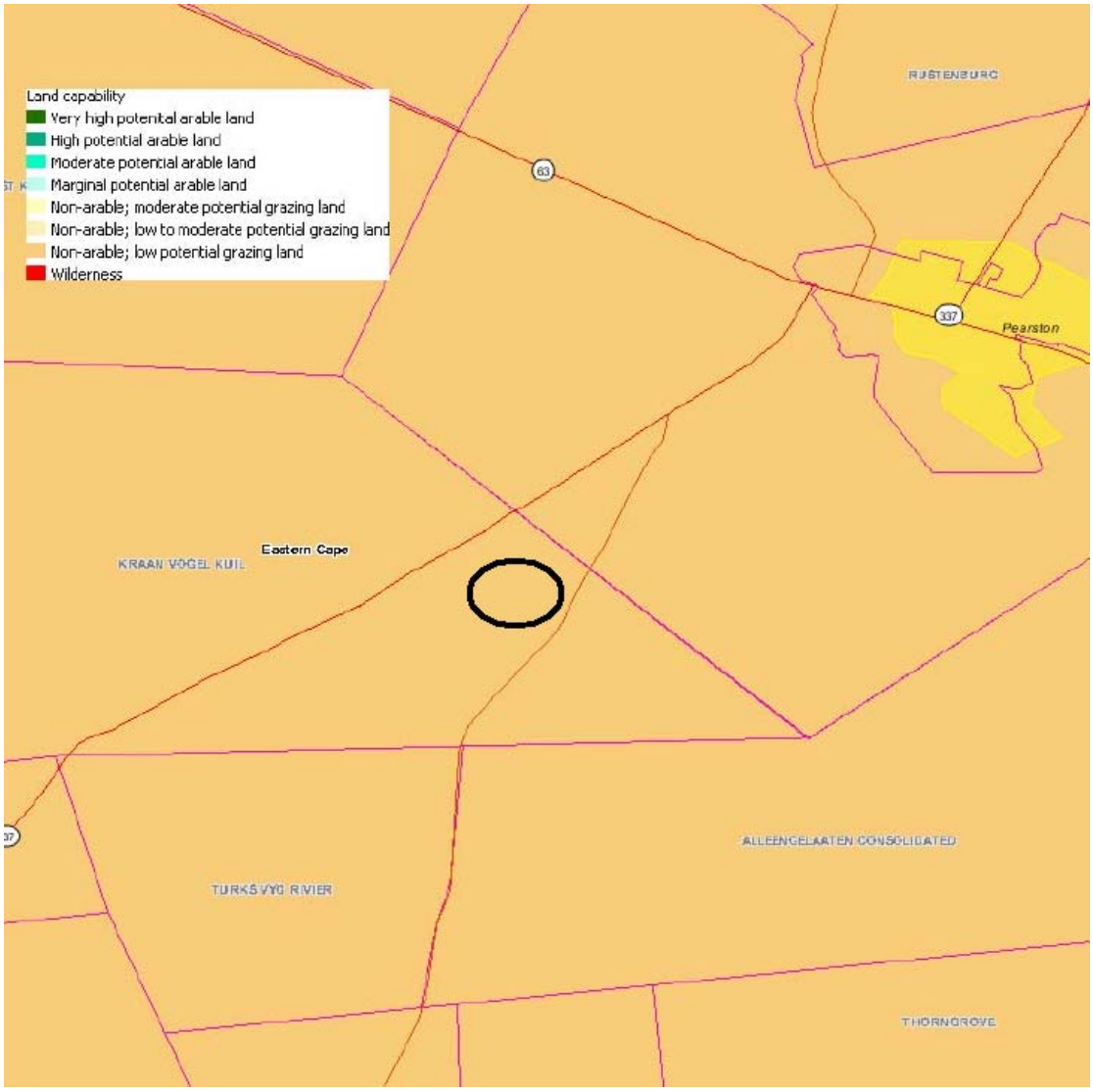
➢ **Figure 30: Site alternative selection.**

5.1.3 Activity Alternatives

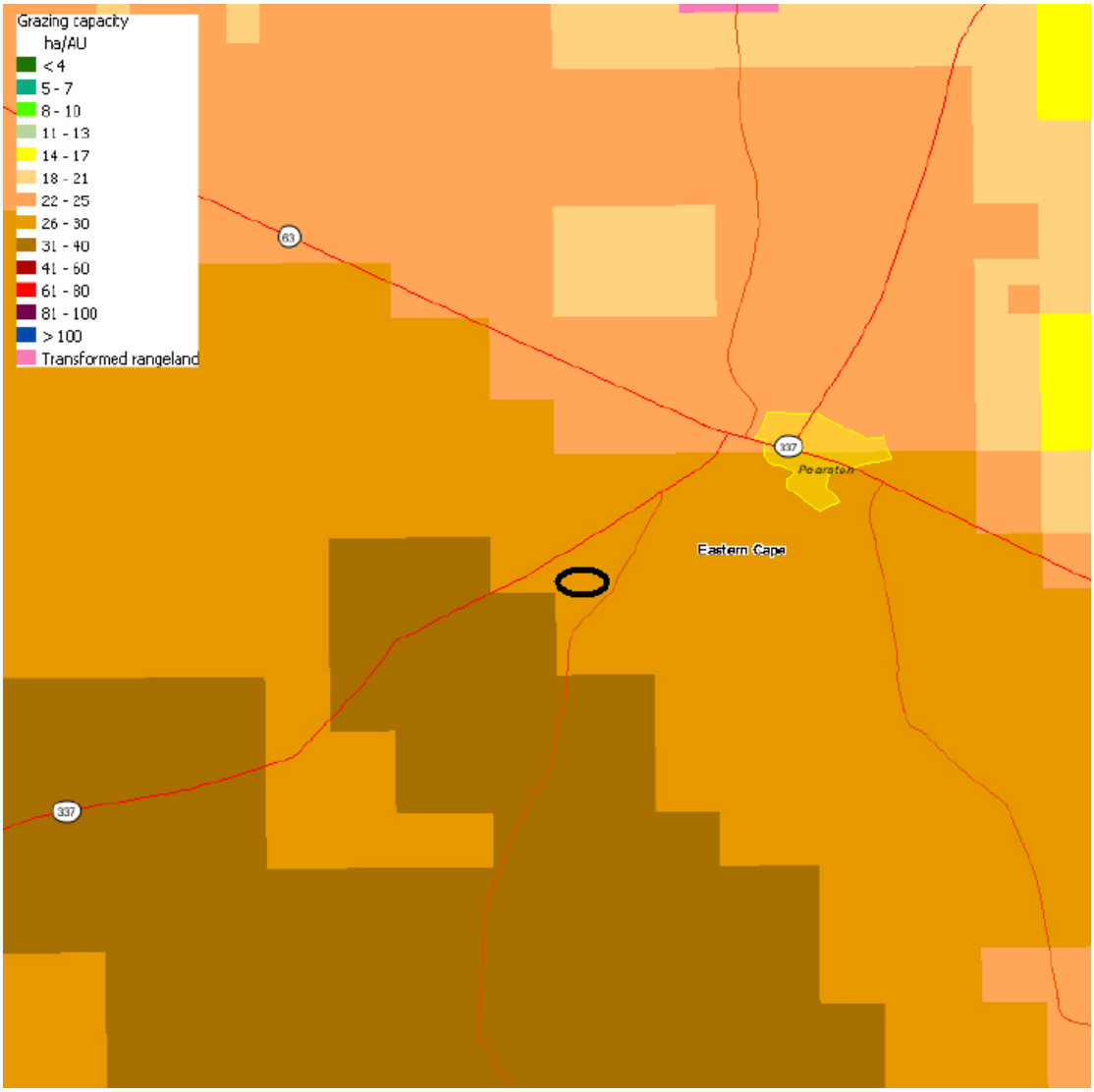
The current land use activity is agriculture (specifically grazing), while the proposed activity is for the establishment of a PV Solar Farm. The local Municipality is the provider of electricity within Blue Crane Route. The formal supply of electricity ranges from a full connection and prepaid system to a ready board system. The majority of consumers have access to either electricity or paraffin as a source of power and heat while street lighting is provided to all urban neighbourhoods except for high mast lighting in Aeroville, Old Location, New Brighton and Francesvale (Somerset East Urban Area). A major capital outlay is however envisaged to upgrade both urban and rural networks. The overhead line from Somerset East to Pearston and other areas is currently running at full capacity. A new transformer is to be installed as an emergency measure. Electricity has been included in the infrastructure analysis because of the importance of this basic service in the lives of all individuals, especially in this area. The Blue Crane Route Municipality has a good infrastructure base but upgrading is needed in order for the service to be provided effectively. A need for energy provision and infrastructure upgraded is therefore evident.

Of the entire Blue Crane Route population a mere 35% of the economically active population is employed and over 40% is not economically active. This puts a great amount of pressure on the employed population to support those that are not employed or economically active and creates a large dependency ratio on the employed percentage. The unemployment rate in the area is approximately 24% (SDF 2006). The photovoltaic plant will create a number of job opportunities for local staff in both the design and "permitting" phase and primarily in the operational phase. There will be a training programme for locals interested in skilled work such as maintenance work. Furthermore, local businesses will also benefit from the proposed development since materials will be purchased locally where available. The BCRM SDF and IDP have highlighted the need for local economic development initiatives.

According to the Department of Agriculture the proposed site consists of non-arable low potential grazing land (Figure 31). The Department of Agriculture has determined the grazing capacity for this area as 26-30 ha/AU (Figure 32). The proposed solar farm will occupy ~135 ha, therefore a loss of grazing capacity for ~ 5 animal units is expected if the solar farm is approved. The number of employment opportunities and/or economic potential for the municipal area that will accrue from agriculture in this instance is substantially less than for the proposed PV Solar Farm. From an economic and social upliftment perspective, the solar farm is therefore the preferred activity.



- **Figure 31: The Department of Agriculture classifies the land capability of the site (black oval) as 'non arable, low potential grazing land'.**



➢ **Figure 32: Grazing capacity of the proposed site (black oval) as classified by the Department of Agriculture (26 – 30 ha per animal unit).**

5.1.4 Technology Alternatives

Two alternative technologies were considered for the solar farm: Crystalline Silicone PV Modules and Thin Film PV Modules. The applicant has selected a crystalline silicone PV module Installation for the following reasons:

While thin film PV modules are more cost effective than Polycrystalline Fixed Solar Panels, thin film modules are less efficient in terms of electricity generation. A much greater number of cells must be used to generate the same amount of electricity as can be generated from crystalline cells. This can result in additional racking and

installation costs and more space and mounting hardware would be required to produce the same amount of output.

Chapter

6

Chapter 6: Methodology

The following section describes the methodology followed in deriving and assessing impacts; identifying and comparing alternatives; and in ensuring the Scoping Report is in accordance with legislated requirements.

Compliance with legislated requirements

The Environmental Impact Assessment Regulations (2010) clearly state the requirements that need to be fulfilled by all role-players involved in the Environmental Assessment Process. In this regard, Regulations 28 to 33 list the requirements that an EAP must fulfill in order to compile a comprehensive Environmental Impact Report and Management Programme.

Regulation 28(1) states than a Scoping Report must contain all information that is necessary for a proper understanding of the nature of issues identified during scoping, and must include:

"(a) details of –

(i) the EAP who compiled the report; and

(ii) the expertise of the EAP to carry out an environmental impact assessment;

(b) a description of the proposed activity;

(c) a description of any feasible and reasonable alternatives that have been identified

(d) 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 –

(i) a linear activity, a description of the route of the activity; or

(ii) an ocean-based activity, the coordinates where the activity is to be undertaken;

(e) a description of the environment that may be affected by the activity and the manner in which activity may be affected by the environment;

(f) an identification of all legislation and guidelines that have been considered in the preparation of the scoping report;

(g) a description of environmental issues and potential impacts, including cumulative impacts, that have been identified;

(h) details of the public participation process conducted in terms of regulation 27(a), including –

(i) steps that were taken to notify potentially interested and affected parties of the application;

(ii) proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the application have been displayed, placed or given;

(iii) a list of persons and organisations that were identified and registered in terms of regulation 55 as interested and affected parties in relation to the application; and;

(iv) 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

(i) a description of the need and desirability of the proposed activity

(j) 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;

(k) copies of any representations, and comments received in connection with the application or the scoping report from interested and affected parties;

(l) copies of the minutes of any meetings held by the EAP with interested and affected parties and other role players which record the views of the participants; and

(m) any responses by the EAP to those representations and comments and views;

(n) a plan of study for environmental impact assessment which sets out the proposed approach to the environmental impact assessment of the application, which must include—

(i) a description of the tasks that will be undertaken as part of the environmental impact assessment process, including any specialist reports or specialised processes, and the manner in which such tasks will be undertaken;

(ii) an indication of the stages at which the competent authority will be consulted;

(iii) a description of the proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity; and

(iv) particulars of the public participation process that will be conducted during the environmental impact assessment process;

(o) any specific information required by the competent authority; and

(p) any other matters required in terms of sections 24(4)(a) and (b) of the Act.

(2) In addition, a scoping report must take into account any guidelines applicable to the kind of activity which is the subject of the application.

(3) 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 (1)(c), exist.

6.1.1 Guidelines published to assist with interpretation of EIA Regulations (2006 and 2010)

To assist with interpretation of these regulations, a set of guidelines was published by DEA. Currently, only the public participation guidelines, guidelines to assist in the interpretation of listed activities and guidelines on environmental management frameworks have been updated with the EIA Regulations (2010). Because of this, Guidelines 3 (General Guide to Environmental Impact Regulations (2006)) and 5 (Assessment of Alternatives and Impacts (2006)); and Guideline 7 (Public Participation (2010)) were consulted for this EIA.

Below are various extracts from these guidelines that were used to inform the project-specific methodology:

6.1.1.1 Methods to identify potential impacts

The identification of the potential impacts of an activity on the environment should include impacts that may occur during the commencement, operation and termination of an activity. In order to identify impacts it is important that the nature of the proposed activity is well understood so that the potential impacts that are associated with the activity can be understood. The process of identification and assessment of impacts includes the:

- determination of current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- determination of future changes to the environment that will occur if the proposed activity does not take place;
- an understanding of the activity in sufficient detail to understand its consequences; and
- the identification of significant impacts which are likely to occur if the activity is undertaken (Guideline 5: Assessment of Alternatives and Impacts).

Types of impacts

Different types of impacts may occur from the undertaking of an activity. The impacts may be positive or negative and may be categorized as being direct (primary), indirect (secondary) or cumulative impacts.
Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a

reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts (Guideline 5: Assessment of Alternatives and Impacts).

6.1.1.2 Methods of predicting and analysing potential impacts

After all the potentially significant impacts have been identified the nature and characteristics of the impacts can be predicted. Impact prediction, or impact forecasting, involves the consideration of physical, biological, socio-economic and cultural information to estimate the likely characteristics and parameters of the impact. The aim of impact prediction is to provide a basis for determining the likely significance of each impact with sufficient accuracy to develop appropriate mitigation measures.

Factors that should be taken into account in impact prediction include:

- the nature of the impact i.e. positive, negative, direct, indirect, cumulative;
- the magnitude of the impact i.e. severe, moderate, low;
- the extent and location of the impact in terms of the area covered, volume distribution, etc;
- when the impact will occur i.e. during construction, operation and/or decommissioning as well as whether the impact will occur immediately or be delayed;

- the duration of the impact i.e. short term, long term, intermittent or continuous;
- the extent to which the impact can be reversed or not;
- the likelihood or probability of the impact actually occurring ; and
- the significance of the impact on a local, regional or global level (Guideline 5: Assessment of Alternatives and Impacts).

6.1.1.3 Mitigation of impacts

Once the impacts have been identified and predicted, appropriate mitigation measures need to be established. Mitigation measures are the steps that are taken to reduce the identified impacts as far as possible. Mitigation measures should address the predicted factors of the impacts clearly to demonstrate how the impacts will be reduced through mitigation. The objectives of mitigation are to:

- find more environmentally sound ways of doing things;
- enhance the environmental benefits of a proposed activity;
- avoid, minimise or remedy negative impacts; and
- ensure that residual negative impacts are within acceptable levels.

6.1.1.4 Evaluating the significance of impacts

After the impacts of an activity have been predicted and mitigation measures have been determined, the impacts must be evaluated to determine how significant the impacts are likely to be.

The process of evaluating significance distinguishes between ‘as predicted’ (the impact before mitigation is considered) and ‘residual’ impacts (the impact after mitigation measures have been taken into account). This process consists of two parts namely:

- evaluating the significance of 'as predicted' impacts to define the requirements for mitigation and other remedial actions; and
- evaluating the significance of the 'residual' impacts that remain after mitigation measures are taken into account.

Key factors that should be considered in evaluating the significance of an impact include:

- environmental standards, guidelines and objectives;
- level of public concern (including both norms and values); and
- scientific and professional evidence of the:
    - loss or disruption of valued resource stocks and ecological functions;
    - negative impact on social values, quality of life and livelihood; and
    - foreclosure of land and resource use opportunities.

The determination of the significance of an impact should also be based on a methodical approach that includes:

- the use of procedures and guidelines established by the competent authority;
- the adoption of relevant criteria from comparable cases;
- a consistent approach to the comparison of alternatives; and
- documenting the reasons for the judgements made.

There are various sets of criteria that can be applied to assist in the determination of significance. The criteria selected for assessing individual activities should be based on the environmental context of the areas in which the activities occur.

The evaluation of the significance of the impact must always consider the likelihood of the impact eventuating and acceptability of risk. Four other criteria to evaluate whether adverse impacts are significant include considering whether the impact will result in:

- environmental loss and deterioration;
- social impacts resulting directly or indirectly from environmental change;
- non-conformity with environmental standards, objectives and guidelines; and
- likelihood and acceptability of risk.

6.1.1.5 The Assessment of Cumulative Impacts

Types of cumulative impacts

Cumulative impacts can arise from one or more activities. A cumulative impact may result in an additive impact i.e. where it adds to the impact which is caused by other similar impacts, or an interactive impact i.e. where a cumulative impact is caused by different impacts that combine to form a new kind of impact. Interactive impacts may be either countervailing (the net adverse cumulative impact is less than the sum of the individual impacts) or synergistic (the net adverse cumulative impact is greater than the sum of the individual impacts).

Steps in assessing cumulative impacts

Four general steps, which are discussed below, are recommended to ensure the proper assessment of cumulative impacts.

Determining the extent of cumulative impacts

To initiate the process of assessing cumulative impacts, it is necessary to determine what the extent of potential cumulative impacts will be. This can be done by adopting the following approach:

- identify potentially significant cumulative impacts associated with the proposed activity;
- establish the geographic scope of the assessment;
- identify other activities affecting the environmental resources of the area; and
- define the goals of the assessment.

Describing the affected environment

The following approach is suggested to the compilation of a description of the environment:

- characterise the identified environmental resources in terms of their response to change and capacity to withstand stress;
- characterise the stresses affecting these environmental resources and their relation to regulatory thresholds; and
- define a baseline condition that provides a measuring point for the environmental resources that will be impacted on.

Assessment of cumulative impacts

The methodology which is used for the assessment of cumulative impacts should be coherent. In general the methodology should comprise of the following:

- an identification of the important cause-and-impact relationships between proposed activity and the environmental resources;
- a determination of the magnitude and significance of cumulative impacts; and
- the modification, or addition, of alternatives to avoid, minimize or mitigate significant cumulative impacts.

6.1.1.6 Assessment of Alternatives

The assessment of alternatives should follow the impact assessment process described above and should, as a minimum, include the following:

- the consideration of the no-go alternative as a baseline scenario (even in cases where the no-go alternative is not a realistic alternative);
- a comparison of the selected alternatives; and
- the providing of reasons for the elimination of an alternative.

Where alternative locations or sites are identified as alternatives, the features of each location or site should be investigated to the same level of detail for the purposes of the comparative assessment of the alternatives. The comparative assessment should at least include the following aspects:

- capital and operating costs;
- direct, indirect and cumulative impacts;
- mitigation measures;
- physical, legal or institutional constraints; and
- compliance with policy and legal requirements.

6.2 Project-specific methodology

The regulations and guidelines highlighted above were used to inform the methodology and approach in predicting and assessing impacts and alternatives in this particular study.

6.2.1 Identifying and Predicting Impacts

A combination of resources/factors was used to identify and predict impacts, including the following:

- Professional judgment (see Appendix 1: *Curriculum Vitae* of EAPs who compiled this report)
- Past experience (see Appendix 1: *Curriculum Vitae* of EAPs who compiled this report)
- Observations made during site visits (see 6.2.1.1)
- Analysis of spatial data (e.g. aerial photography, GIS tools, topographical maps)
- Consideration of environmental planning guidelines (presented in Chapter 4)
- Discussions with various professionals (e.g. engineers, planners, competent authorities)
- Consideration of comments raised by Interested and Affected Parties (see 6.2.1.2)
- Perusal of relevant and recent scientific publications

6.2.1.1 Site Visits

Members of CEN IEM Unit visited the site from 5 to 8 December. The site visit was used to determine the nature of the affected environment and to identify potential environmental issues of concern.

Based on the site visit and the information gathered, the consultants identified potential significant impacts and potential cumulative impacts that are associated with the proposed development. This information was used to compile the Scoping Report.

6.2.1.2 Identification of Interested and Affected Parties

Two adverts were place in *The Herald* and *Die Burger* on 22 November 2011 and in the *Somerset East Budget* on 8 December 2011 (Chapter 9).

A poster was placed on the northern entrance to the site, and on the notice board at the municipal offices in Pearston (Chapter 9). Background Information Documents were distributed to all identified stakeholders (Chapter 9).

A copy of the Draft Scoping Report was submitted to the Eastern Cape Department of Economic Development and Environmental Affairs for commenting purposes and to the National Department of Environmental Affairs for review purposes. Electronic copies of the Executive Summary of the Draft Scoping Report were sent to all registered I&APs and relevant government and non-government organizations. An electronic copy of the full Draft Scoping Report was made available electronically on request. Interested and Affected Parties were given a 40 day review period to make comments on the Draft Scoping Report. This period has now expired – no comments were submitted.

6.2.2 Criteria used to assess impacts

The following criteria will be utilized to assess the predicted impacts. Results will be based on qualitative data and will be presented in a summary table for each impact. In each instance, individual variables will be compared with the 'no-development' option, and a distinction will be made between the effects that the activities will have on the receiving environment with and without mitigation measures in place. This should place the reader and the authorities in a position to make an informed decision on whether the development should proceed or not.

In the criteria presented below, a scale of how each can be measured and/or rated is discussed. This scale is based on qualitative data and the assignment of 'values' in each instance will be done in an objective manner. This will be achieved by using objectively-derived data gathered from various sources (i.e. recommendations from specialist studies and other scientific publications, measurements and observations made during detailed site investigations, consideration of comments from interested

and affected parties, discussions with relevant stakeholders, and perusal of relevant environmental planning guidelines). The assignment of values will therefore not merely be based on the opinion of the EAP, but on a variety of inputs and published sources thereby minimizing the potential 'skewing' effect of bias on the final outcome.

Table 6 is a template illustrating how these results will be presented.

- **Table 6: Template of how impacts will be analysed**

	No-go option (status quo)	Development (without mitigation)	Development (with mitigation)
Extent • Site only • Sub-regional • Regional • National			
Duration • Short term (0-5 yrs) • Moderation term (5 – 15 yrs) • Long term (15 yrs+)			
Intensity/magnitude: • None • Low • Medium • High			
Probability • Improbable • Probable • Highly probable • Definite			
Significance • No impact			

• Low • Moderate • High			
Status • Positive • Negative • Neutral			
Degree of confidence • High • Low			

6.2.2.1 Extent:

Whether the impact will occur on a scale limited to the immediate areas or site of the development activity or will the impact occur on a sub-regional, regional and/or national scale.

6.2.2.2 Duration

Whether the lifetime of the impact will be of a short duration (0-5 years); medium term (5-15 years); long-term (15 years, with the impact ceasing after the operational life of the development); or considered permanent where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

6.2.2.3 Intensity/Magnitude:

Whether the intensity (magnitude / size) of the impact is high, medium, low or negligible (no impact). Where possible the intensity of impacts are quantified.

6.2.2.4 Probability:

The probability of the impact actually occurring as either improbable (low likelihood); probable (distinct possibility); highly probable (most likely) or definite (impact will occur regardless of preventative measures).

The above will be evaluated in terms of:

6.2.2.5 Significance:

The significance of impacts of the proposed project are assessed with the mitigation measures which will be included in the contractors specifications as well as with the additional mitigation measures recommended in this report being implemented. The significance of the identified impacts on the components of the affected environment (and where relevant, with respect to potential legal infringement) are described as:

No Impact

Where the project action will not cause any adverse or beneficial changes to the natural (biophysical), and/or socio-economic environment.

Impact of Low Significance

Where the project actions will result in minor short-term changes to the biophysical and/or socio-economic environment. The impacts will usually be restricted to the immediate area of the project action. The affected system should return to its natural or almost natural state in a short period of time (0 - 5 years). The impacts on human populations will be of a short duration and will not have any lasting consequences.

Impact of Moderate Significance

Where the project actions will result in moderate short-term or medium term changes to the biophysical and/or socio-economic environment. The effects of the impact could be experienced outside of the project action area and may be evident at a sub-regional or even a regional level. Minor indirect impacts may arise from the project action. The system should recover but it is unlikely that it will return to its natural state. Recovery would only take place in the medium term (5-15 years). Impacts on the human population will be felt after the project action is completed but are not severe and/or disruptive to their quality of life or economic well being.

Impacts of High Significance

Where the project actions will result in major long-term changes to the biophysical and/or socio-economic environment. The effects of the impact will be experienced outside of the project action area and may be evident at a regional, national and even at the international level. Secondary or indirect impacts may arise from the project action. The system may recover over the long-term (>15 years) but will not revert to its natural state. Impacts on human populations will be felt after the project action is completed. The impacts are of a long-term nature and are disruptive to the previous life style of the affected population.

Determination of significance is made on the assumption that any mitigation and / or management measure, which is recommended, will be implemented by the developer.

Status of the Impact:

This describes whether the impact is positive (a benefit) or negative (a cost), or neutral.

6.2.2.6 Degree of Confidence in Predictions:

The degree of confidence in the predictions, based on the availability of information and/or specialist knowledge.

6.2.3 Mitigating Environmental Effects

Mitigation is used to address all adverse environmental effects, whether or not subsequent analysis determines that the effects are significant. The development of the mitigation measures commenced during the scoping assessment and many have become part of the project design. Relevant mitigation measures should form part of any contract for the project.

6.2.4 Identifying and comparing alternatives

Chapter 6 describes the process that was followed in identifying potential project alternatives and how it was assessed whether they are feasible and/or reasonable. In each instance, the preferred alternative is specified as an end-point and carried through to Chapter 7 to be assessed as a potential impact. The methodology described above for the assessment of impacts will be used in the comparative assessment of project alternatives.

Chapter

7

Chapter 7: Environmental Impacts and Potential Issues

Introduction

This chapter describes the environmental issues and potential impacts associated with the proposed construction and operation of a solar farm. Once impacts have been identified, the report recommends a way forward to assessing the environmental issues and potential impacts.

Identification of Environmental Issues and Potential Impacts Associated with the Proposed Development

Regulations 28 (f) and (n)(iii) of the NEMA EIA Regulations (2010) state that with regards to impact identification and prediction, the contents of a Scoping Report must include the following:

"(g) a **description** of environmental issues and potential impacts, including cumulative impacts, that have been **identified**;
(n)(iii) a description of the proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity;"

Guideline 5 of the EIA Regulations (2006) gives the following recommendations on impact identification:

“The identification of the potential impacts of an activity on the environment should include impacts that may occur during the commencement, operation and termination of an activity.

In order to identify impacts it is important that the nature of the proposed activity is well understood so that the potential impacts that are associated with the activity can be understood. The process of identification and assessment of impacts includes the:

- determination of current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured; (*addressed in Chapter 4)*
- determination of future changes to the environment that will occur if the proposed activity does not take place; *(addressed in Chapter 4 and 5)*
- an understanding of the activity in sufficient detail to understand its consequences; *(addressed in Chapter 3 and to be elaborated in the EIA)* and
- the identification of significant impacts which are likely to occur if the activity is undertaken”. *(to be addressed in this Chapter 7)*

Based on the above, the following potential environmental issues and impacts have been identified:

7.1.1 Biodiversity Impacts

Vegetation has been subjected to overgrazing with the result that species composition has changed from its original state; however substantial species richness was recorded by the ecological specialist in his site survey. Overgrazing is manifest in the bare areas occurring between vegetation tufts and clumps and the paucity of perennial grasses and the abundance of annual and perennial sour grasses. Sheet erosion is present throughout the area although most evident away

from rocky and gravelly soils, promoting pedestal development and the presence of flow lines. Area 4 appears to have the best soil cover while areas 1 and 3 are the poorest ((Jacobsen, 2011).

The number of floral species recorded for three of the sites is similar despite the small size of Area 3, but was substantially more for Area 4. The area falls within the Albany Centre of Endemism (Van Wyk & Smith 2001) rich in endemic succulents and non-succulents, some of which have been recorded in the areas surveyed. These include *Euphorbia ferox, Rhombophyllum* sp*., Mestoklema tuberosum, Cyrtanthus helictus, Drimia anomala* and *Duvalia modesta*. Two forms of the *Crassula capitella* complex also appear to be endemic and may represent undescribed forms or species, while the occurrence of what appears to be *Duvalia parviflora,* is a new record for the Eastern Cape and far removed from the nearest record in the Little Karoo between Ladismith and Oudtshoorn. It is listed as Vulnerable in the Red List of South African Plants 2009 (Raimondo *et al* 2009) due to habitat loss from agricultural practices (Jacobsen, 2011). The occurrence of species regarded as 'not occurring abundantly on site' has been recorded and presented to the engineers for protection in the preferred layout plan (to be presented in the EIA).

The fauna of the area appears to be poor, in part perhaps due to anthropogenic activities such as predator control. Few species were recorded but many others are expected to occur or be transient through the areas. Few rare and threatened species are present, these limited to the avifauna. Species which will be most affected are Blue Crane which were recorded foraging adjacent to Area 3, as well as Ludwig's Bustard (Jacobsen, 2011). The site is not part of the list of internationally important bird areas (BirdLife International).

Assuming 100% site sterilization, a significant loss of vegetation species is expected and impacts on the intrinsic value of biodiversity are predicted. Loss of vegetation means loss of available habitat (forage, shelter, breeding) for fauna. Other possible impacts on fauna include disturbance and collisions during construction phase, and impacts on birds from collisions with powerlines (although existing) in operational

phase. During the ecological site survey, it was noticed that the current powerlines are not fitted with avian avoidance devices, which may have resulted in mortalities of Blue Crane and Ludwig's Bustard individuals, in particular the latter. According to Barnes (2000) these pose the most serious threat to these species in the eastern Karoo resulting in a mortality rate of one bird/ km/ annum in the case of Ludwig's Bustard. It is imperative that appropriate marking devices be put in place as well as on any new distribution and transmission lines which may arise from the development (Jacobsen, 2011).

The site is part of a critical biodiversity area and is classified as a broad land management class 2 area in the ECBCP (2007). Impacts on ecological connectivity and biodiversity persistence will be assessed in the EIA.

Biodiversity impacts will be assessed in detail in the EIA, and mitigation measures will be given to reduce the significance of identified impacts.

7.1.2 Pollution

Various forms of pollution may be associated with the proposed development. These include noise pollution, air (mostly dust in construction phase), and surface and groundwater contamination via general construction and operational activities.

Dust pollution will mostly occur during construction phase when vegetation is cleared and will be exacerbated during high wind conditions if not properly controlled. Exhaust emissions from construction activities include those associated with the transporting of workers, machinery and materials to and from the site as well as those produced on site as the equipment is used. Emissions associated with the construction phase are considered to be of a low significance and will be of a short duration. Impacts on air quality during the operation phase will primarily be associated with exhaust emissions from vehicles. It is not expected that the activity will result in a significant increase in traffic in operational phase.

Noise will occur during construction phase with large vehicles transporting panels to the area. The activity is also relatively labour intensive. Significant noise levels are

not anticipated in operational phase - photovoltaic systems are the quietest of all systems that generate electricity. The need for moving parts that are typical of all traditional systems of electricity generation from fossil fuels and also many systems from renewable sources is insignificant in PV farms. The only moving parts, which generate negligible noise, are ventilation systems for cooling the inverter and transformers located inside the prefabricated cabins. These are only active during daylight hours and the cabins are located at some distance from the boundary of the site, thereby reducing possible noise impacts on surrounding land users and grazing animals on nearby farms.

The standard impacts on soil, surface and groundwater from construction activities are predicted (e.g. fuel spillages, cement mixing, improper storage of construction wastes, etc) and these can be prevented by good environmental practice. A Construction Environmental Management Programme will be submitted with the EIA which will discuss site management in construction phase and give guidelines to avoid impacts. In operational phase, solar panels will be washed to remove dust using water. Relatively small volumes will be used and panels will be washed at low frequencies, and based on the nature of the runoff (i.e. dust), contamination is not expected in operational phase.

7.1.3 Soil impacts

Impacts on soil during construction phase include disturbance and erosion if not properly rehabilitated and contamination from oils, fuel, cement mixing, and improper waste management. If rehabilitation and soil stabilization is not successful, erosion can continue into operational phase. As mentioned above, dust will be washed off solar panels to improve absorption efficiency. This water must not be allowed to wash any sediment into drainage lines especially that situated just south of the site. Standard mitigation measures will be included in the EIA to prevent the possibility of soil contamination and erosion.

7.1.4 Archaeological Impacts

A Phase 1 Archaeological Impact Assessment has been done by Dr Johan Binneman (report attached as Appendix 4). The study concluded that the site is of low archaeological sensitivity and that the development may proceed as planned. The following recommendations were made:

- No solar panels must be constructed within 20 metres of the concentration of Later Stone Age stone tools (GPS reading: 32.36.019S; 25.06.379E).
- If any concentrations of archaeological material are uncovered during development, it should be reported immediately to the Albany Museum and/or the South African Heritage Resources Agency.
- Construction managers/foremen should be informed, before construction starts, on the possible types of heritage sites which may be encountered during construction.

7.1.5 Socio-Economic Impacts

A specialist socio-economic impact assessment will be done as part of the EIA phase which will consider the possible impact of the facility on surrounding land users and communities. It is expected that there will be economic benefits for the applicant as well as supporting industries and persons to be employed in construction and operational phase. The applicant has made a commitment to support the local community by supplying solar panels to schools and providing scholarships for students for further studies, as well as developing a community trust. The applicant has also engaged with the Nelson Mandela Metropolitan University to assist in alternative energy research. Being one of the first solar panel farms in the country, the corporate image of the local authority may be enhanced, making it more attractive for further investment in the future.

On a broader level, the solar farm will contribute to the provision of clean energy from a renewable resource, and reduce the need for coal power stations which will

assist in reducing the amount of greenhouse gas generation and the impacts of climate change.

7.1.6 Loss of Agricultural Land

An agricultural report has been done by Dr L. Pisani (attached as Appendix 3). His investigation concluded that the agricultural potential of the site is relatively low, and that the site is too small to contribute significantly to the economy or food security of the area (or the farm on which they are situated upon). Areas 3 and 4 (refer to Figure 2) are situated in an agriculturally sensitive area and special water run-off control measures should be adopted. Special care should also be taken to make sure that these sites are situated not less than 100m from the edge of the watercourse. This recommendation has been sent to the engineers for consideration in the preferred layout alternative (to be presented in the EIA).

According to the Department of Agriculture the proposed site consists of non-arable low potential grazing land (Figure 31). According to CARA (Conservation of Agricultural Resources Act 43 of 1983) the official carrying capacity for the area is 17 ha per large stock unit. CARA seeks to provide for the conservation of natural agricultural resources by maintaining the production potential of land, combating and preventing erosion and weakening or destruction of water resources, protecting vegetation and combating weeds and invader species. According to Veld types of South Africa by J.P.H Acocks the site falls in zone no. 31 (Succulent karoo) that consists mainly of short karoo bushes, succulent plants, scrubs and grasses. The estimated area needed for the 55 MW plant will is ± 138 ha which will mean a loss of only 8.1 Large Stock Units or 54 Small Stock Units. It will not be a total loss as this area can still be utilized by sheep. The solar plant will be fully compatible with veld management systems where they are farming with sheep. The intervention of the solar plant will be minimal (extracted from a letter of support for the project written by the Eastern Cape Department of Agriculture, Rural Development and Agrarian Reform – Mr A Snyman).

7.1.7 Visual Impacts

A viewshed analysis was done by Wendy Todkill for the approved 10 MW solar farm which is located on the same farm just north of the R 337 (attached as Appendix 6). The same technology is proposed and therefore the height and layout of panels is assumed to be similar. The landscape is also fairly homogenous with slight undulations and low lying 'ridges'. The outcomes of the study will be used to guide the visual impact of this application.

Results of the viewshed analyses showed that a solar farm on Portion 2 of the Farm Kraan Vogel Kuil No 50 will be visible from certain viewpoints within the surrounding landscape. These include the residents of the town of Pearston (both southern and northern sections); farms to the east of the development site (Viewpoint 5 Alleengelaten); farms to north of the site (Viewpoint 9 Wildebeeskuil, Viewpoint 10 Bogentwini and Viewpoint 11 Jackson); as well as the road users along both the sections of the R63 and R337. Visual impacts on surrounding land users will be assessed in the EIA.

Cumulative Impacts

Cumulative impacts that the proposed activities may have on environmental, social and economic attributes of the surrounding area will be assessed in the EIA. This may, for example, include cumulative impacts on biodiversity, and the socio-economic status of Pearston.

Chapter

8

Chapter 8: Plan of Study

Field investigations linked to a review of the literature and discussions with the project team as well as the issues raised by Interested and Affected Parties have indicated that several more in-depth investigations are necessary in order to fully evaluate the potential environmental impacts.

Proposed Specialist Studies

The following specialist studies will be done:

8.1.1 Socio-Economic Impact Assessment

8.1.1.1 Terms of Reference

- Determine the impact of the proposed facility on the local and regional socio-economic environment

8.1.2 Agricultural Study

8.1.2.1 Terms of Reference

- Determine whether the proposed sites are of such high agricultural potential that the proposed development would lead to a significant loss of agricultural potential in the area and the property it is situated upon, and

- Determine whether the sites are situated within agriculturally sensitive areas.

8.1.3 Ecological Specialist study

8.1.3.1 Terms of Reference

- Survey vegetation and fauna of the study site
- Comment on predicted impacts on biodiversity
- Give recommendations to reduce and/or minimse predicted impacts

8.1.4 Level 1 Archaeological Impact Assessment

8.1.4.1 Terms of Reference

- Establish the range and importance of possible exposed and *in situ* archaeological sites/materials,
- Discuss potential impact of the development, and
- Make recommendations to minimize possible damage

Stages at which authorities will be contacted

According to the Regulation 30 of the EIA Regulations (2010) promulgated in terms of NEMA (Act 107 of 1998), authorities must within 30 days of acknowledging receipt of a Scoping Report, either accept or reject the report, or request additional information. If no comment is received within the stipulated timeframes, the authorities will be contacted.

Proposed method of assessing impacts

The method of assessing impacts discussed in detail in Chapter 6 of this report.

Way Forward

The Draft Scoping Report identified potential impacts associated with the proposed construction and operation of a solar farm. All identified stakeholders were notified and asked to participate in the environmental process. The Draft Scoping report was submitted to the Provincial Department of Economic Development and Environmental Affairs and the Eastern Cape Department of Agriculture, Rural Development and Agrarian Reform for comment.

All registered parties were sent an electronic copy of the Executive Summary of the Draft Scoping Report and notified of the importance of commenting and identifying any issue which CEN IEM Unit may have overlooked and which they feel needs to be addressed in the EIA. A full copy of the Draft Scoping Report was made available in electronic format to all those that request it. The stakeholder comment period has now expired, and no comments have been received.

Chapter

9

Chapter 9: Public Participation Process and Response

Steps That Were Taken To Notify Potentially Interested and Affected Parties of the Application

The standard media advertisements were placed in *The Herald* and *Die Burger* on 22 November 2011 and the *Somerset East Budget* on 8 December 2011. Two notices were placed at visible locations – one on the northern boundary of the site near the entrance gate, and the other at the municipal offices in Pearston.

THE HERALD
22·11·2011

NOTICE OF ENVIRONMENTAL IMPACT PROCESS

Notice is hereby given in terms of Regulation (56) of the Environmental Impact Assessment EIA Regulations (Government Notice R.543 in Government Gazette 33306 of 18 June 2010) and in terms of Chapter 5 of the National Environmental Management Act as amended (Act 107 1998) to carry out the following activities:

IMVELOYETHO POWER COMPANY (PTY) LTD intends to construct a 55 MW solar farm and associated infrastructure.

TYPE OF ASSESSMENT: Scoping and Environmental Impact Assessment

LOCALITY: Portion 2 of the FARM KRAAN VOGEL KUIL NO 50, Pearston, Eastern Cape.

CONSULTANT:
Dr Mike Cohen
CEN Integrated Environmental Management Unit
36 River Road, Walmer
Port Elizabeth, 6070
Tel: (041) 581-2983/
Fax: 086-504-2549
E-mail:
steenbok@aerosat.co.za

Interested and Affected Parties are invited to participate in the process by submitting detailed written comment on the anticipated listed activities within 30 days of this advertisement (10 January 2012).

Date: 22 November 2011

22·11·2011
~~DIE BURGER~~

Kennisgewing

Omgewingsimpakproses

Kennis geskied hiermee, kragtens Regulasie (56) van die Omgewingsimpakstudie- (OIS) regulasies (Staatskennisgewing R543 in Staatskoerant 33306 van 18 Junie 2010) en kragtens Hoofstuk 5 van die Wet op Nasionale Omgewingsbestuur, soos gewysig (Wet 107 van 1998), om die volgende aktiwiteite uit te voer:

Imveloyetho Power Company (Pty) Ltd is van voorneme om 'n 55 MW sonplaas en verwante infrastruktuur op te rig.

Tipe evaluasie: Omvangsbepaling en omgewingsimpakstudie

Ligging:
Gedeelte 2 van die Plaas Kraan Vogel Kuil Nr. 50, Pearston, Oos-Kaap

Konsultant:
Dr. Mike Cohen
CEN Integrated Environmental Management Unit
Riverweg 36, Walmer
Port Elizabeth, 6070
Telefoon: 041 581 2983 / Faks 086 504 2549
E-pos: steenbok@aerosat.co.za

Belangstellende en geaffekteerde partye word genooi om aan die proses deel te neem deur gedetailleerde geskrewe kommentaar rakende die verwagte gelyste aktiwiteite binne 30 dae van hierdie advertensie (10 Januarie 2012) in te dien.

Datum: 22 November 2011

4399038(1B5P5X5) 22/11(180)

SOMERSET BUDGET 8·12·2011

Notice of Environmental Impact Process

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IMVELOYETHO POWER COMPANY (PTY) LTD intends to construct a 55 MW solar farm and associated infrastructure.

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Scoping and Environmental Impact Assessment.

LOCALITY: Portion 2 of the FARM KRAAN VOGEL KUIL NO. 50, Pearston, Eastern Cape.

CONSULTANT: Dr Mike Cohen, CEN Integrated Environmental Management Unit. 36 River Road, Walmer. Port Elizabeth. 6070.
Tel: (041) 581 2983
Fax: 086 504 2549
Email: steenbok@aerosat.co.za

Interested and Affected Parties are invited to participate in the process by submitting detailed written comment on the anticipated listed activities within 30 days of the advertisement (31 January 2012)

Date: 8th December 2011

Background Information documents were sent to those Provincial and National Government Departments with a potential interest in the development and other relevant stakeholders:

- Government and municipal officials:

Department/Organisation	Official/Responsible Person
Heritage Council	Mariagrazia Galimberti
Department of Water Affairs	L. Fourie, A. Lucas, P. Retief, J. Jacobs, C Swarts, M Bloem, P. Tshatshu, P. De Wet
Department of Forestry	Thabo Nokoyo, Gwen Sgwabe, Theo Stehle
Department of Economic Development and Environmental Affairs	A. Struwig, D. Govender
Blue Crane Route Municipal Officials	The Mayor, Municipal manager, information officer, corporate services, financial services
Blue Crane Route Development Agency	Chris Wilken, Rob Beech
Eastern Cape Department of Agriculture	Andre Snyman, Louanne Botha, Sharlene Matthews
National Director of Land Use and Soil Management (DAFF)	L. Mongoato
National Department of Agriculture	A Collett
ESKOM	Mavis Sitole, Tom Smith
WESSA	M. Griffiths
Ward Councillor	Mr Mene

- Neighbours and other stakeholders
    - Landowner (Koos Moolman)
    - Farmers Association (Blair du Randt)
    - Library in Pearston

In response to the initial public participation phase, the following persons registered as Interested and Affected Parties:

- Koos Moolman
- Director of Land Use and Soil Management: L Mongoata
- Brenda Smith
- M. Kane
- G. Mintoor
- J. Martin

The Executive Summary of the Draft Scoping Report was emailed to all persons who registered as well as to all relevant local, provincial and national government departments.

Summary of the Issues Raised By Interested and Affected Parties, the Date of Receipt of and the Response of the Environmental Assessment Practitioner to Those Issues

Table 7 is a summary of comments received from Interested and Affected Parties and the Environmental Assessment Practitioner's response thereto.

- **Table 7: Comments and Response Report**

I&AP	Comment	EAP response
K Moolman	Request to be registered	Registered and will be kept updated of the process
L. Mongoato (Director: Land Use and Soil Management)	This serves as a notice of receipt and confirms that your application has been captured in our electronic AgriLand tracking and management system. Reference number issued	Reference number noted. Will be kept updated of the process
B. Smith	Request to be registered and am in favour of the development	Registered and will be kept updated of the process

M. Kane	Request to be registered and am in favour of the development	Registered and will be kept updated of the process
G. Mintoor	Request to be registered and am in favour of the development	Registered and will be kept updated of the process
J. Martin	Request to be registered and am in favour of the development	Registered and will be kept updated of the process

The section that follows contains verbatim copies of all correspondence from Interested and Affected Parties. All of the issues raised will be investigated and addressed in the EIA.

K Moolman

CEN IEM UNIT
36 River Road, Walmer, Port Elizabeth 6070
Fax 086 504 2549 Email steenbok@aerosat.co.za

Registration / Comment Sheet

Environmental Assessment: Construction of a 55 MW solar farm and associated infrastructure

5 December 2011

I wish to register as an Interested and / or Affected Party and request that the following issues receive attention during the assessment process
Closing Date for Comments: 23 January 2012

Name of Respondent: J V G Moolman
Organisation / Company:
Address: Kraanvoëlkuil, Pearston, 5860
Fax Number: 0866481085
Tel Number: 042-2461498 - 0827887230
Email: kmoolman@jabama.co.za

Please use additional sheets as necessary

Signature: _____ Date: 15/01/2012

L Mongoata

Directorate Land Use and Soil Management, Private Bag x120, Pretoria, 0001
Delpen Building, c/o Annie Botha & Union Streets, Riviera

From: Director: Land Use and Soil Management
Tel: (012) 319 7634 Fax: (012) 329 5938 e-mail: agriland@nda.agric.za

CEN IEM UNIT
36 RIVER ROAD
WALMER
PORT ELIZABETH
6070

2011/12/19

Dear Sir/Madam

This serves as a notice of receipt and confirms that your application has been captured in our electronic AgriLand tracking and management system. It is strongly recommended that you use the on-line AgriLand application facility in future.

Detail of your application as captured:

Type: **EIA**
Your reference number: **KVK 50/2**
Dated: **12 DECEMBER 2011**

Please use the following reference number in all enquiries:

AgriLand reference number: 2011_12_0190

Enquiries can be made to the above postal, fax or e-mail address.

Yours sincerely,

L. Mongoato
pp DIRECTOR: LAND USE AND SOIL MANAGEMENT

Online application available at: http://www.agis.agric.za/agriland

B Smith

CEN IEM UNIT
36 River Road, Walmer, Port Elizabeth 6070
Fax 086 504 2549 Email steenbok@aerosat.co.za

Registration / Comment Sheet

Environmental Assessment: Construction of a 55 MW solar farm and associated infrastructure

5 December 2011

I wish to register as an Interested and / or Affected Party and request that the following issues receive attention during the assessment process
Closing Date for Comments: 23 January 2012

Name of Respondent: Brenda Smith
Organisation / Company: U.C.CHURCH
Address: 1882 Barcelona Str. Fearston
Fax Number: 0422461659
Tel Number: 0840809125
Email:

I would like registered and is in favour of the assessment.

Please use additional sheets as necessary

Signature: B Smith Date: 05/01/12.

M Kane

CEN IEM UNIT
36 River Road, Walmer, Port Elizabeth 6070
Fax 086 504 2549 **Email** steenbok@aerosat.co.za

Registration / Comment Sheet

Environmental Assessment: Construction of a 55 MW solar farm and associated infrastructure

5 December 2011

I wish to register as an Interested and / or Affected Party and request that the following issues receive attention during the assessment process
Closing Date for Comments: 23 January 2012

Name of Respondent: M. KANE
Organisation / Company: SPARTB.
Address: 4A AKASIASTREET, NELSIG, PEARSTON 5860
Fax Number: -
Tel Number: 0740682369.
Email:

I WOULD LIKE REGISTERED AND IS IN FAVOUR OF THE ASSESSMENT

Please use additional sheets as necessary

Signature: M. KANE Date: 11/01/2012

G. Mintoor

CEN IEM UNIT
36 River Road, Walmer, Port Elizabeth 6070
Fax 086 504 2549 Email steenbok@aerosat.co.za

Registration / Comment Sheet

Environmental Assessment: Construction of a 55 MW solar farm and associated infrastructure

5 December 2011

I wish to register as an Interested and / or Affected Party and request that the following issues receive attention during the assessment process
Closing Date for Comments: 23 January 2012

Name of Respondent: GODFREY R. MINTOOR
Organisation / Company: CBO.
Address: 49 HUDSON STR PEARSTON
Fax Number: 042 2461659
Tel Number: 079 8863284
Email:

I WOULD LIKE REGISTERED AND IS IN FAVOUR OF THE ASSESSMENT.

Please use additional sheets as necessary

Signature: Date: 14/01/12.

J. Martin

CEN IEM UNIT
36 River Road, Walmer, Port Elizabeth 6070
Fax 086 504 2549 **Email** steenbok@aerosat.co.za

Registration / Comment Sheet

Environmental Assessment: Construction of a 55 MW solar farm and associated infrastructure

5 December 2011

I wish to register as an Interested and / or Affected Party and request that the following issues receive attention during the assessment process
Closing Date for Comments: 23 January 2012

Name of Respondent: J. MARTIN
Organisation / Company: C BC.
Address: 92 LOOP STREET, NELSIG, PEARSTON
Fax Number:
Tel Number: 0848985260
Email:

I WOULD LIKE REGISTERED AND IS IN FAVOUR OF THE ASSESSMENT.

Please use additional sheets as necessary

Signature: J. MARTIN Date: 13/01/12

Chapter

10

Chapter 10: Reference List

- Anon, (1974). Extreme values of rainfall, temperature and wind for selected return periods, Part II. W.B.36, Weather Bureau, Department of Transport, Pretoria, 29pp.
- Barrow, J. (1801). *An account of travels into the interior of Southern Africa.* Vol 1. London: T Cadell and W Davies.
- Department of Environment Affairs (1992) The Integrated Environmenta*l Procedure- Guideline Document No. 1*
- Department of Environmental Affairs and Tourism (1997). White Paper on the Conservation and Sustainable Use of South Africa's Biodiversity
- Guidelines for Human Settlement Planning and Design compiled by the Department of Housing and Construction Technology (2000).
- Hartmann (1988). The Soils of the Eastern Cape. In: *Towards an Environmental Plan for the Eastern Cape.* Editors: Bruton and Gess, Rhodes University, Grahamstown.
- International Council for Local Environmental Initiatives. (1994). Local Agenda 21 Handbook. 42 pp.

- IUCN (1992). World Heritage Twenty Years Later. A Report Based on Papers Presented at the World Heritage and Other Workshops Held During the IVth World Congress on National Parks and Protected Areas, Caracas, Venezuela. February 1992.
- IUCN, WWF and UNEP (1991). Caring for the Earth: A Strategy for Sustainable Living. IUCN, UNEP and WWF.
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- Louw, W.J. (1976). Meso-climate of the Port Elizabeth-Uitenhage metropolitan area. Technical Paper No.4, Weather bureau, Department of Transport, Pretoria, 60pp.
- Mucina, L. and Rutherford, M. C. (eds) 2006. *The vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria
- Rust, I.C. (1988). The Geology of the Eastern Cape. In: *Towards an Environmental Plan for the Eastern Cape.* Editors: Bruton and Gess, Rhodes University, Grahamstown.
- Toerien, D.K. and Hill, R.S. (1989). The geology of Port Elizabeth. Geological survey: explanation of sheet 3324. Department of Mineral and Energy Affairs, Pretoria.

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Document Printed March 2012

List of Appendices

Appendix 1: Curriculum Vitae of persons responsible for compiling the Scoping Report

Appendix 1: Curriculum Vitae of responsible Environmental Assessment Practitioners

Lead Consultant: Dr Mike Cohen

Michael Cohen

CEN Integrated Environmental Management Unit

36 River Road

Walmer, Port Elizabeth. 6070

Telephone: (+27) 041-581-2983

Facsimile: 086 504 2549

E-mail: steenbok@aerosat.co.za

Date of Birth:

18 January 1945

Nationality:

South African

Languages:

English (mother tongue), Afrikaans (good)

Qualifications:

B.Sc. (Zoology, Psychology. Wits. RSA).

B.Sc. (Hons) (Wildlife Management. U Pretoria).

M.Ag. (Wildlife and Fisheries Ecology: Texas A&M). (1973)

D.Sc. (Wildlife Management. U Pretoria). (1988)

Institutions:

South African Council of Natural Scientists (SACNAS)

Professional Member - Institute of Ecologists and Environmental Scientists

Member - International Association for Impact Assessment - South African Chapter

Member of IUCN Commission on National Parks and Protected Areas. (CNPPA) (1994 -1996)

Member of IUCN World Commission on Protected Areas (1997 – current)

Honorary Member of the Institute of Environment and Recreation Management of Africa 1995

Appointed to the Board of the Institute of Ecologists and Environmental Scientists - April 1997-May 2000

Referee to environmental assessment practitioners applying to the Interim Certification Board for Environmental Assessment Practitioners (ICB) for professional certification (2001 - present)

Appointed to the Council of the Provincial Heritage Resource Authority. Ministry of Sport, Arts and Culture. Province of the Eastern Cape 2003 (Resigned)

Professional History:

May 1996 – Present

Environmental Consultant: CEN Integrated Environmental Management Unit

July 1995 - May 1996

Director: Eastern Cape Nature Conservation. Ministry of Economic Affairs, Environment and Tourism. Left to start own consultancy business

January 1993 - June 1995

Regional Director: Cape Nature Conservation. Eastern Cape Region

October 1985 - December 1992

Deputy Director: Environment. Chief Directorate: Environmental Conservation Directorate: Environmental Management Department of Environment Affairs

July 1983 - September 1985

Assistant Director: Environment Chief Directorate: Environmental Conservation Department of Environment Affairs

March 1981 - July 1983

Chief Professional Officer Chief Directorate: Environmental Conservation Department of Environment Affairs

June 1978 - February 1981

Regional Ecologist: Transvaal Nature Conservation Division: Eastern Region (TPA)

August 1976 - May 1978

Officer-in-Charge. Suikerbosrand Nature Reserve Transvaal Nature Conservation Division (TPA)

1972 - July 1976

Research Assistant Eugene Marais Chair of Wildlife Management University of Pretoria

Specialist Courses:

- 1993 Completed the certificate course in Public Management at the University of Pretoria. The certificate was awarded Cum Laude
- 1989 Completed course in Practical Techniques in Environmental Impact Assessment conducted by the Environmental Evaluation Unit at the Graduate School of Business, University of Cape Town
- 1973 Completed the International Seminar on the Administration of National Parks and Equivalent Reserves held in the United States, Canada and Mexico
- 1973 Completed short course in Tropical Ecology while at Texas A & M University

International Experience:

- Nominated as a member of an international team to evaluate the professional activities of the Nature and National Parks Protection Authority of Israel (Evaluation was to be conducted during November 2000)
- 1994 - Represent South Africa as Scientific Councillor on the Convention on Migratory Species - Nairobi, Kenya
- 1994 - Alternate delegate for South Africa at the Conference of the Parties of the Convention on Migratory Species - Nairobi, Kenya
- 1994 -Member of the negotiations team for the African Eurasian Waterfowl Agreement - Nairobi, Kenya
- 1993 -Represent South Africa as Scientific Councillor on the Convention on Migratory Species - Bonn, Germany
- 1992 -Visit to Israel to hold preliminary discussions on a bilateral agreement on Nature and Environmental Conservation
- 1992 -Participate in the IV World Congress on National Parks and Protected Areas - Caracas - Venezuela - Present two papers at the Congress and participate in numerous working groups on a wide range of protected area issues

- 1991 - 1995 South African Representative on the Scientific Council for the Convention on Migratory Species
- 1990 -Visit to England and Israel (met with a variety of nature and environmental conservation organisations) for discussion on joint projects and for discussions on national and regional protected area systems plans
- 1989 -Member of South African delegation to the XV Antarctic Treaty meeting, Paris
- 1988 -Delegate to the 17th IUCN General Assembly - Costa Rica
- 1986 -Seminar on Environmental Education - Israel

Specialisation in Firm:

Integrated Environmental Management, Environmental Impact Assessment, Rural Development, Natural Resource Planning and Management

Recent Experience:

Environmental Impact Assessment:

2006 – To Present Selected Projects

- Scoping Exercise for a Proposed Pilot Aquaculture Operation for the Grow-Out of Penaeus vannamei Prawn Larvae For Commercial Purposes Within the Coega Industrial Development Zone at Port Elizabeth Eastern Cape Province Ballastrada Trade and Investments (Pty) Ltd, Trading as SeaArk Africa
- Environmental Management Plan for a Pilot Aquaculture Operation for the Grow-Out of *Litopenaeus vannamei* Prawn Larvae For Commercial Purposes, Coega Industrial Development Zone at Port Elizabeth, Eastern Cape Province
- Environmental Assessment for a Proposed Interpretive Centre, Day Visitor Site and Boardwalk Trail in the, Baviaanskloof Mega-Reserve Wilderness Foundation
- Environmental Assessment for a Proposed Residential Development, Remainder of Erf 328 Kabeljous River Jeffrey's Bay

- Environmental Assessment for the Augmentation of the Jeffrey's Bay Bulk Water Supply System (Pump Station, Supply Mains from Churchill Supply Mains and 5 Ml Reservoir)
- Environmental Assessment for the Proposed Augmentation of the Jeffrey's Bay Main Electrical Substation
- Environmental Assessment for a Proposed Residential Development, Remainder of Farm Noorsekloof 327, Jeffrey's Bay
- Environmental Assessment for the Proposed Rezoning and Subdivision of Portion of Portion 8 of the Farm Kabeljous River No. 321, Jeffrey's Bay
- Sensitivity Assessment for the Subdivision of Portion 1 (Remaining Extent) of the Farm Klein Buffelsfontein No 477/1
- Environmental Assessment for a Proposed Resort Development, Portion 84 of the Farm De Stades No. 485, Beachview
- Environmental Assessment for the Rezoning and Subdivision of the Remainder of the Farm Boschkloof No. 896, Division of Humansdorp
- Environmental Assessment for the Rezoning of Portion B of the Remainder of Farm 428 to "Special Zone Nursery"
- Environmental Management Programme Report for a Proposed Sand, Clay and Calcrete Mining Operation in the Coega Valley on Portions 1 and 4 of the Farm Welbedachtsfontein, 300, Port Elizabeth
- Environmental Assessment for Subdivision and Rezoning of Erf 483 Bushman's River for Residential Development
- Environmental Assessment for the Rezoning of Farms 328/1, 328/2 and Farm 779, Jeffrey's Bay, Kabeljouws-on-Sea

2001 – 2004 Selected Projects

- Environmental Assessment for the Extension of the Tsitsikamma Golf Estate.
- Environmental Assessment for a Residential Development in Jeffrey's Bay.

- Environmental Assessment for a Township Development in Jeffrey's Bay
- Environmental Assessment for Luxury Lodges and a Tent camp on the Mkambati Nature Reserve
- Environmental Assessment for a Boat Launch Facility at Gwe-Gwe, Mkambati Nature Reserve
- Environmental Assessment for a Boat Launch Facility at Kings Beach Port Elizabeth
- Environmental Assessment for the Port Elizabeth Golf Course Estate
- Environmental Assessment for a Resort Development on the Kromme River
- Environmental Assessment for the Establishment of a Presidential Suite at the Eagles Cragg Lodge, Shamwari Game Reserve
- Environmental Assessment for the Establishment of a Golfing Estate at the Port Elizabeth Golf Club
- Environmental Assessment for the Eskom Tsitsikamma 66kV powerline
- Environmental Assessment for three resorts in the Zuurrberg Area
- Environmental Assessment for a Satellite Resort on the Gorah Concession Area, Addo Elephant National Park
- Environmental Assessment for the Alicedale Golf Resort Development
- Environmental Assessment for three lodges on the Lalibella Game Reserve
- Environmental Assessment for the closure of the Marina Martinique Small Boat Harbour
- Environmental Assessments for two caravan parks on the Gamtoos River
- Environmental Assessment for the upgrading of the Road from Flagstaff to Holy Cross

- Biophysical Environmental Assessment on the proposed ESKOM Power line to feed the Aluminium Smelter at Coega
- Environmental Assessment of the Bayethe Game Reserve
- Environmental Assessment of Eagles Cragg Game Lodge – Shamwari Game Reserve
- Environmental Impact Assessment on the Sanderlings Coastal Wetland Resort
- Scoping Report for boat mooring facilities on the Kromme River to serve a residential resort
- Class Environmental Assessment for Working for Water projects in terms of the new DWAF Environmental Evaluation System
- Environmental Scoping for a Housing Development on a Portion of Land in the Van Stadens Wildflower Nature Reserve
- Environmental Impact Assessment on two Leather Tanneries in Middelburg, Eastern Cape Province
- Compilation of an Environmental Evaluation System for the Department of Water Affairs and Forestry (DWAF) (Eastern Cape) This environmental evaluation system is currently being incorporated into the national DWAF's Environmental Management System
- Compilation of an Environmental Evaluation Administration System and Manual for the Department of Water Affairs and Forestry

Natural Resource Management

- Environmental Management Plan for the King Williamstown - East London National Road
- Investigation into the Protected Area Estate in the Province of the Eastern Cape: A Review of Goals and Objectives, Strengths and Weaknesses and an Analysis of Various Institutional Structures Suitable for Achieving the Goals and Objectives.

- Design and run RSA's premier stewardship programme (The South African Natural Heritage Programme and Sites of Conservation Significance Programme)
- Co-ordinate South African Plan for Nature Conservation
- Management Plan for the Suikerbosrand Nature Reserve
- Management Plan for the Marion and Prince Edward Islands (Draft).
- Protected Area Systems Plan
- Management Plans for game farmers
- Bioregional Planning

Policy

- Arrange and run two DWAF regional information sessions for the DWAF Regional Offices and Provincial Government Departments of the Western and Eastern Cape on the Implementation of the DWAF's (Eastern Cape) Environmental Evaluation System (2001). A further seven provincial workshops will follow.
- Run five Eastern Cape Information Sessions for District Municipalities in the Eastern Cape Province on the Implementation of the DWAF Environmental Evaluation System (2001)
- Member DANCED Review Mission on the National Waste Management Strategy
- Compile South African National Report to the Convention on Biological Diversity
- Sub-consultant to the Drafting team for the National White Paper on Integrated Pollution Control and Waste Management.
- Member of a six person drafting team for the National Green Paper on an Environmental Management Policy for South Africa where I represented the nine provinces.

- Appointed as one of the Reference Group for the National White Paper on an Environmental Management Policy for South Africa.

Papers and Publications:

- Author and co-author of some 27 papers, reports and conference presentations as well as a number of popular papers on environmental conservation.

Selected Clients

South African

- BKS
- Blue Crane Development Agency
- Crown Chickens
- Department of Environmental Affairs and Tourism
- Department of Water Affairs and Forestry
- Lalibela Private Game Reserve
- Mandela Bay Development Agency
- Municipality of Port Elizabeth (Nelson Mandela Metropole)
- Ninham Shand (Eastern Cape)
- Portnet
- Shamwari Game Reserve (Mantis Collection)
- South African National Roads Agency Ltd
- Stewart Scott (Eastern Cape)
- Telkom South Africa
- Vodacom South Africa
- Wilderness Safaris

International

- DANCED (Denmark)
- IDRC (Canada)
- European Union

Environmental Scientists: Dr Belinda Clark

Dr Belinda Clark

Curriculum Vitae: Belinda Joan Clark

Qualifications

- B.Sc (Botany, Geology)
- B. Sc Honours (Botany: ecology, environmental management, agriculture)
- M.Sc (Botany: Marine Eco-physiology)
- PhD (Botany: Marine Ecology, focusing on marine pollution)

Awards:

- UPE Scholar Merit Award (Matric Results), Deans Bursary (2001-2003)

Fields of research:

- Third year project:

Habitat Requirements of Estuarine macrophytes of the Eastern Cape.

- Honours projects:

(1) Determination of indigenous plant sales by Port Elizabeth nurseries.

(2) Population Dynamics of *Cyclopia* sp. of the Eastern Cape.

- Masters project: The effect of potential pollutants on the surf-zone diatom, *Anaulus australis*

- PhD Project: Microalgae as indicators of coastal pollution in South African surf-zones

- Techniques courses:
Computer literacy, Photography, Microscopy, Land Surveying, Statistics, First Aid Level 1

Other studies and Workshops:

- Workshop on the EIA Regulations (2010) (East London, 2011)

- Workshop on Environmental Impact Assessments in Coastal Areas (Kenton, 2011)

- International Training Course on Urban Environmental Management (Sweden, 2010)

- Eastern Cape Tour Guide Course: January 2010

- Introduction to Wildflower Identification: January 2010

- National Biodiversity Planning Forum (2009)

- National Biodiversity Planning Forum (2008)

- Identification workshop on the *Ericaceae* family

Seminars delivered:

- Geography Conference – April 2011: Environmental Impact Management in South Africa

- NMMU Botany Department – May 2009: Environmental Management – the good, the bad and the ugly

- Thicket Forum – August 2008: Case study: Towards implementing environmental planning guidelines (STEP, MOSS, ECBCP) in EIAs

- Phycological Society of Southern Africa (PSSA) - January 1999: The effect of water-solute oil extracts and metals on oxygen evolution rates by *Anaulus australis*.

- PSSA – July 2000: The effect of excess concentrations of nitrate, ammonium, and phosphate on cell division cycles of *Anaulus australis*.

- PSSA – January 2002: Microalgae as indicators of pollution in surf-zones in Algoa and St Francis Bay

- PSSA – January 2003: Increases in surf-zone nutrient concentrations as a result of increased septic tank outflow after an Easter weekend

- PSSA – January 2004: Surf-zone water quality and the associated microalgal species composition

- SAAB – January 2002: Microalgae as indicators of pollution on the south coast of South Africa

- South African Marine Science Symposium (SAMSS) – January 2005 – Factors determining the dominance of dinoflagellate cells versus *Anaulus australis*.

- UPE Departmental Seminars - Hydroponics (1997), Aspects of ecophysiology of *A. australis* (1998), Microalgae as indicators of pollution (project proposal) (2000), Microalgae as indicators of pollution (2001)

Career Biography

- Nelson Mandela Metropolitan University (North Campus) (Ja*n 2004)*

- *Resp*onsibilities:

  Lecturer in Epidemiology II, III and IV (Department of Environmental Health)

  Supervising and participating in various post-graduate research projects, dealing largely with community health and environmental pollution

✸ IECM (January 2000 – December 2003)

- Responsibilities:

  Coega Harbour Environmental Monitoring and Cerebos Saltworks contracts – water and sediment quality analyses, microalgal counts, invertebrate sorting

✸ Nelson Mandela Metropolitan University (South Campus) (March '97)

- Responsibilities:

  - Practical demonstrator - conducting and marking practicals for undergraduate students
  - Grysbok Trail Guide – leading school groups on educational trails through the Nature Reserve on campus
  - Field Research Assistant: saltmarsh rehabilitation (Thesens Island), succulent thicket rehabilitation (Addo Elephant National Park), management of biota of solar saltworks (Velddrif and Swartkops), age structure of tree Euphorbias (various areas throughout the Eastern Cape), freshwater requirements of estuarine macrophytes (Seekoei River estuary, Eastern Cape)

✸ UCT Freshwater Research Unit (January '99 – 2000)

- Responsibilities:

  Data capturing for Hydraulics Biotype Database

  Laboratory work

Recent experience (CEN IEM Unit: 2008 - 2011):

Basic Assessment Reports

Completed Projects:

1. BAR for the proposed erection of an above-ground 2300 l diesel storage tank for a standby generator in an industrial area (Aberdare Cables)
2. BAR for the proposed rezoning and subdivision of a Portion of Erf 349, New Brighton to develop the Helenvale Community Centre (multi-purpose hall and offices) as part of the Helenvale Urban Renewal Programme.
3. BAR for the proposed augmentation of bulk water supply to Nieu-Bethesda, Camdeboo Municipality, Eastern Cape
4. BAR for the establishment of an oyster nursery on Erf 171, Swartkops (old coal power station site).
5. BAR for the proposed development of an Eco-Estate on Portion 190 of Chelsea 25, comprised of 18 residential units and associated infrastructure
6. BAR for the proposed Development and erection of a prototype 300 KW wind turbine adjacent to the Neptune Substation in the Coega IDZ.
7. BAR for the proposed rezoning and subdivision of Portion 75 of the Farm Kragga Kamma No 23 for rural-residential development.

Current Projects:

1. BAR for the proposed excavation of a portion of the western channel of the Bushmans Estuary, Eastern Cape
2. BAR for the proposed subdivision of Portion 3 of Farm No 43 in Theesecombe into 3 portions, Eastern Cape
3. BAR for the proposed sinking and pumping of two boreholes and further pumping of an additional 3 existing boreholes to supply water to the proposed Cob Creek Estate on Portion 21 of the Farm Kabeljaauws Rivier No 321 in Jeffreys Bay, Eastern Cape
4. BAR for the proposed establishment of lodges and tented camps, as well as the necessary services infrastructure on sections of the following farms in the divisions of Jansenville and Pearston, Eastern Cape Province: Remainder of the Farm Vlak Nek No 31, Ptn 1 of the Farm Vlak Nek No 31, Farm 30, Farm 101, Ptn 1 of the Farm Groot Kloof No 32, Remainder of Farm Groot Kloof No 32, Ptn 1 of the Farm Jacobsdal No 33, Remainder of Farm Jacobsdal No 33, Ptn 1 of the Farm Hinchinbrook No 92, Farm Oudeberg No 94, Ptn 4 of the Farm Smitskraal No 113, Remainder of the Farm Russouwspoort No 115, Remaining Extent of the Farm Smitskraal No 113, and Ptn 1 of the Remaining Extent of the Farm Smitskraal No 113 .

5. BAR for the proposed rezoning, subdivision and consolidation of portions of Erf 1 and Erf 6, and the entire Erf 15831in Uitenhage to develop housing (Joe Slovo Housing Project).
6. BAR for the proposed rezoning of Portion 30 of the Farm Maitlands No 478, Uitenhage from Agricultural Zone I to Resort Zone 2 to develop holiday housing

Environmental Impact Reports

Completed Projects:

1. EIA for a Low-Density Golf and Agricultural Estate on the Remainder of the Farm Excelsior No 443, Division Joubertina
2. EIA for the Proposed Development of an Integrated Residential Estate on Erven 5614 and 5616, KwaNobuhle, Uitenhage, Eastern Province
3. EIA for the Proposed Establishment of the Sardinia Bay Golf Estate on Erf 378 Theesecombe, Port Elizabeth
4. EIA for Roll-Out Phase of an Aquaculture Operation for the Grow-Out of *Litopenaeus vannamei* Prawn Larvae for Commercial Purposes and a Process Plant, Zones 1 and 10, Coega Industrial Development Zone, Port Elizabeth, Eastern Cape Province
5. EIA for an Eco-Estate on Farm 36 and 37, Theesecombe, Port Elizabeth

Current Projects:

1. EIA for the proposed rezoning and subdivision of Farm 484 in the Humansdorp District, Eastern Cape, to establish a mixed-use development.
2. EIA for the proposed development of a Leisure Estate (Kadouw Leisure Estate) on Remainder of Farm 201, Ptn 15 of Farm 194, and Farm 627 in the Sundays River Valley area
3. EIA for the Proposed Rezoning and Subdivision of Ptn 1 and 118 of the Farm Chelsea 25 (Kragga Kamma Game Park), Port Elizabeth, Eastern Cape
4. EIA for the Proposed Rezoning of Portions 55, 56, 62 and 81 of the Farm Maitland Mines No 478, Uitenhage, Eastern Cape to Establish Lodge Developments and a Nature Reserve
5. EIA for the Proposed Rezoning, Subdivision, and Consolidation of Farm Vrede No. 190, Knysna, Western Cape for a Residential Development (Simola Phase 3)
6. EIA for the Proposed Rezoning and Subdivision of Portion 1 of the Farm Seaview No 28 in Port Elizabeth for a Residential Development and Associated Infrastructure

7. EIA for the Proposed Rezoning and Subdivision of Erven 402,403, 438 and 726, Theesecombe, Port Elizabeth to establish a Residential Development and Associated Infrastructure

Sensitivity Assessments/Environmental Situational Assessments/Specialist Input Studies

Completed Projects:

1. Sensitivity Assessment of Ashmead Resort in Knysna, Western Cape
2. Sensitivity Assessment for the creation of a high intensity mixed-use waterfront development on Erf 577 and a portion of Erf 578, Kings Beach, Port Elizabeth
3. Environmental Comment on the Proposed Port St Johns Master Plan
4. Specialist investigation of the Kariega River Estuary in response to a proposed housing development on the eastern bank of the estuary.
5. Vegetation Specialist report for the Motherwell NU-31 project
6. Environmental input into the Happy Valley LSDF, Port Elizabeth
7. Environmental input in the Inner City Plan LSDF, Port Elizabeth
8. Scoping Report: A review of available information of operations at the Manganese Ore Terminal and Storage Facility and Tank Farm on Erf 578 at the Port Elizabeth Harbour area with emphasis on environmental transgressions
9. Sampling protocol to determine the extent of potential contamination in the environment surrounding the Manganese Ore Facility and Fuel Storage Tanks in the Port Elizabeth Harbour

Current Projects:

1. Ecological Specialist study for the NMBM (Coega) Reclaimed Effluent Scheme – Phase 1
2. Due Diligence Audit of Eyethu Fishing at the Port Elizabeth harbour

Environmental Auditing

Completed Projects:

1. Environmental Audit for the Upgrading of a Stormwater Channel and Wetland in Blue Water Bay
2. Environmental Audit for the Construction of Kenton Eco-Estate and Associated Infrastructure on the Farm Remainder of Grants Valley 396, Kenton-on-Sea
3. St Francis Bay Marina Extension: Final Audit
4. Environmental Auditing of the Tsitsikamma Roads project

Water Use Applications

Current Projects:

1. Water Use Application (Section 21 (c) and (i) of the National Water Act) for the proposed construction of a low-level culvert bridge and the installation of wet services across the Seaview Stream on Farm 36 and 37 in Theesecombe, Port Elizabeth.
2. Water Use Application (Section 21 (a), (c), (i), and (g) for Ibamba Private Game Reserve
3. Water Use Application (Section 21 (a) and (g) for Maitlands Hotel and Lodge developments

Waste Licence Applications

Current Projects

1. Waste Licence for the proposed augmentation of the existing Waste Water Treatment Works in Nieu-Bethesda
2. Waste Licence for a package plant on Ptns 55, 56 and 81 of Farm 478, Maitlands, Port Elizabeth
3. Waste Licence for a package plant on Farm 36 and 37, Theesecombe, Port Elizabeth
4. Waste Licence for 4 package plants on Ibamba Private Game Reserve, Jansenille.
5. Waste Licence for an on-site waste water treatment works for Kadouw Leisure Estate, Sundays River valley area.

Appendix 2: Title Deeds

53 VIR ENDOSSEMENTE KYK BLADSY
FOR ENDORSEMENTS SEE PAGE

Fairbridge
Prokureurs, Notarisse en Transportbesorgers
van Kaapstad

Opgestel deur my,

TRANSPORTBESORGER
L R LE ROUX

FEE

R.....

T 00002414 / 2006

TRANSPORTAKTE

HIERMEE WORD BEKENDGEMAAK DAT

MARGARET ANNE BOAG

voor my, Registrateur van Aktes te Kaapstad verskyn het, en dat die genoemde komparant behoorlik daartoe gemagtig is kragtens 'n volmag uitgevoer te Somerset East op die 15 Augustus 2005, deur

DIE TRUSTEES INDERTYD VAN DIE
PIERRE MOOLMAN TESTAMENTÊRE TRUST
Nr 1714/89

('die transportgewer')

DATA CAPTURE
14 FEB 2006

welke volmag my hede getoon is:

For Information Only

5/

BC 025240/09

GEKANSELLEER
CANCELLED

REGISTRATEUR/REGISTRAR

18 JUN 2009

LANDBANK

VERBIND MORTGAGED

VIR
FOR R 160 000-00

B 0003470/2006

16 JAN 2006

REGISTRATEUR/REGISTRAR

VERBIND MORTGAGED

VIR
FOR R 500 000-00

B 0001626 3/2009

18 JUN 2009

REGISTRATEUR/REGISTRAR

For Information

En die Komparant het verklaar dat sy genoemde Prinsipaal op die 15 Junie 2005 waarlik en wettiglik die ondergemelde eiendom aan die ondergemelde Transportnemer verkoop het en dat hy in sy voornoemde hoedanigheid sedeer en transporteer in volle en vrye eiendom aan en ten gunste van

JACOBUS VAN GEND MOOLMAN
Identiteitsnommer: 650807 5095 089
Getroud buite gemeenskap van goed

('die transportnemer')

Sy erfgename eksekuteurs administrateurs of regverkrygendes

GEDEELTE 2 VAN DIE PLAAS KRAAN VOGEL KUIL NR 50, IN DIE BLUE CRANE ROUTE MUNISIPALITEIT, AFDELING VAN PEARSTON, PROVINSIE VAN DIE OOS-KAAP

GROOT: 1776,4431 (Een duisend sewe honderd en ses en sewentig komma vier vier drie een) Hektaar

SOOS AANGEDUI op die aangehegte Kaart L.G. Nr 4137/2004 en gehou kragtens Akte van Verdelingstransport Nr T12999/1959.

A. **ONDERHEWIG** aan die voorwaardes vervat in die Grondbrief gedateer 21 Desember 1870 (Somerset-Oos Erfpagte Boekdeel 13 Nr 17) waarvan die volgende voorwaarde een is: -

"That the rights of Government on all mines of gold, silver or precious stones within the said land with free acces to and egress from the same, are reserved".

B. **KRAGTENS** Notariële Akte Nr K927/1975S geregistreer op 10 Desember 1975 is die Restant van die Plaas Kraan Vogel Kuil Nr. 50, geleë soos hierbo, groot 3361,2286 hektaar, onderhewig aan 'n reg ten gunste van Elektrisiteitsvoorsieningkommissie om elektrisiteit oor die eiendom te vervoer, tesame met ondergeskikte regte, en onderhewig aan voorwaardes, soos meer volledig sal blyk uit verwysing na gemelde Notariële Akte.

C. **KRAGTENS** Notariële Akte van Omskrywing van Serwituut Nr K1197/1989S gedateer 1 Desember 1989 het Eskom die reg uitgeoefen soos voorbehou in Notariële Akte Nr K927/1975S geregistreer op 10 Desember 1975 om die serwituut meer volledig te beskryf, soos meer volledig sal blyk uit gemelde Notariële Akte.

For information only

(die middel van welke kraglynserwituut, 31,00 meter wyd, voorgestel word deur die lyn a b c op aangehegte Kaart L.G Nr. 4137/2004).

D. **KRAGTENS** Notariële Akte Nr K379/2004S is die Restant van die Plaas Kraan Vogel Kuil Nr 50, geleë soos hierbo, groot 3361,2286 hektaar, onderhewig aan 'n kraglynserwituut ten gunste van Eskom met bykomende regte, soos meer volledig sal blyk uit gemelde Notariële Akte.

For Information Only

WESHALWE die Komparant afstand doen van al die regte en titel wat die Die trustees van die transportgewer Trust voorheen op genoemde eiendom gehad het en gevolglik ook erken dat die Die trustees van die transportgewer Trust geheel en al van die besit daarvan onthef is en nie meer daartoe geregtig is nie en dat kragtens hierdie Akte bogenoemde transportnemer Sy erfgename eksekuteurs administrateurs of regverkrygendes tans en voortaan daartoe geregtig is, ooreenkomstig plaaslike gebruik, behoudens die regte van die Staat: en dat die koopprys van die binne gemelde eiendom ten bedrae van R580 000.00 (Vyf honderd en tagtig duisend rand) behoorlik betaal of verseker is.

TEN BEWYSE WAARVAN ek, die genoemde Registrateur, tesame met die Komparant, hierdie Akte onderteken en die met Ampseël bekragtig het.

Aldus gedoen en geteken op die kantoor van die Registrateur van Aktes, te Kaapstad, op hede die 16 Januarie 2006.

~~2005.~~

q.q.

In my teenwoordigheid,

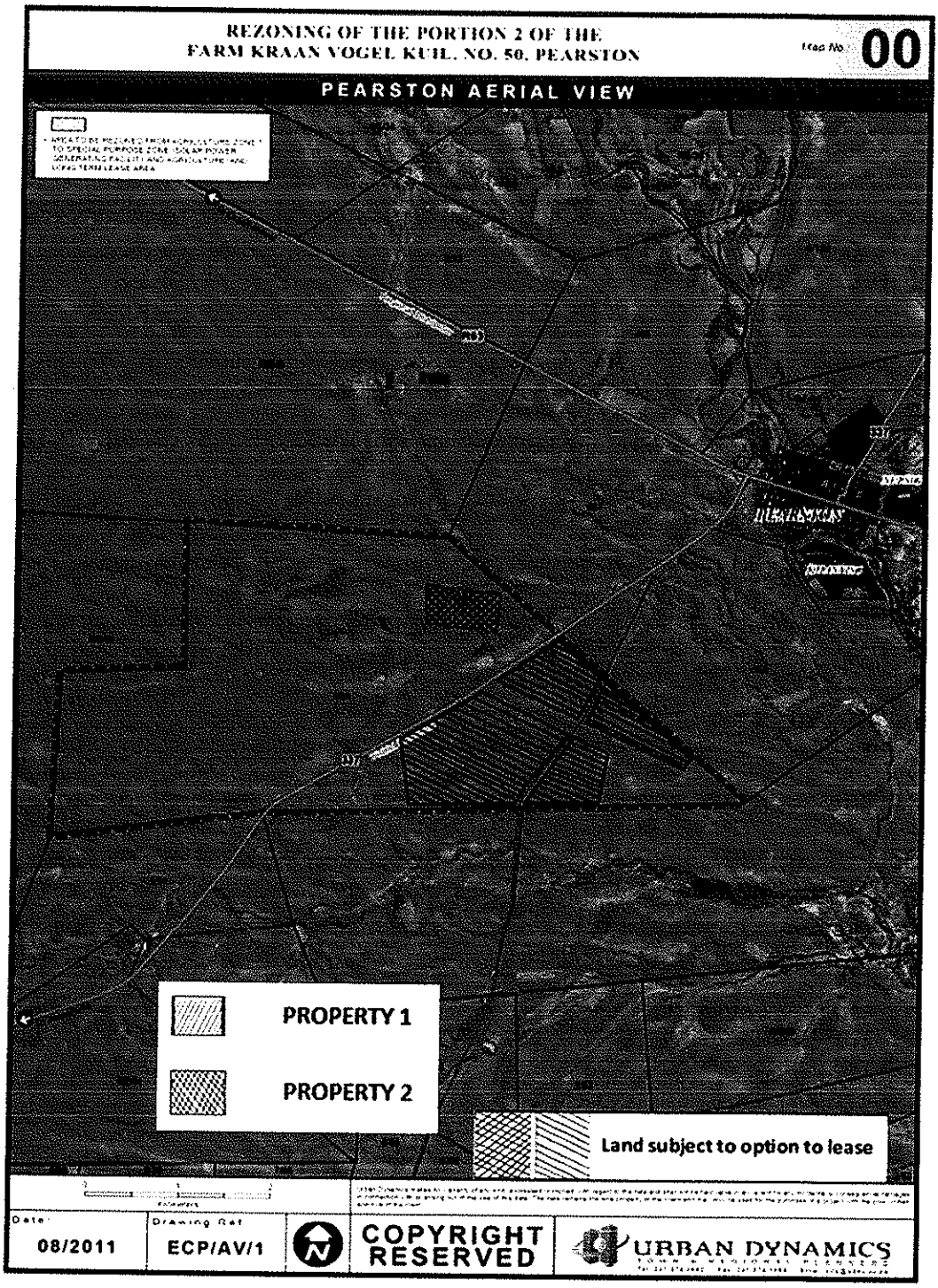
REGISTRATEUR VAN AKTES

(c:\my documents\deeds\323048\LLER\nr)

For information only

7.1.1.4. the parties hereto have obtained the required consent from the relevant Minister in terms of the Subdivision of Agricultural Land Act, No 70 of 1970 (as amended) for the registration of the lease over the portion of the property identified by the lease diagram and Annexure A to this agreement.

ANNEX A


REZONING OF THE PORTION 2 OF THE
FARM KRAAN VOGEL KUIL. NO. 50. PEARSTON
Map No. 00
PEARSTON AERIAL VIEW
PROPERTY 1
PROPERTY 2
Land subject to option to lease
Date
08/2011
Drawing Ref
ECP/AV/1
COPYRIGHT RESERVED
URBAN DYNAMICS

GEREGISTREERDE WOON- EN POSADRES

1. Bewaar die bewys van u GEREGISTREERDE WOON- EN POSADRES in alle gevalle.

2. Indien u van adres verander het, of indien besonderhede van u huidige adres, bv. straatnaam en/of -nommer, ens. verander het, moet die vorm KENNISGEWING VAN ADRESVERANDERING wat in die sakkie agter in die identiteitsdokument is, gebruik word om die verandering aan te meld en moet dit ingedien word by of gepos word aan die naaste streek-/distrikkantoor van die DEPARTEMENT VAN BINNELANDSE SAKE.

REGISTERED RESIDENTIAL AND POSTAL ADDRESS

1. ... REGISTERED RESIDENTIAL AND POST...

2. ... ess, or, if particulars of your ... and/or street number, etc., have ... NGE OF ADDRESS form in the ... ocument must be used to report ... ed in at or posted to the nearest ... RTMENT OF HOME AFFAIRS.

1

I.D.No. 650807 5095 08 9

S.A.BURGER/S.A.CITIZEN

VAN/SURNAME

MOOLMAN

VOORNAME/FORENAMES

JACOBUS VAN GEND

GEBOORTEDISTRIK OF-LAND/
DISTRICT OR COUNTRY OF BIRTH

SUID-AFRIKA

GEBOORTEDATUM/
DATE OF BIRTH

1965-08-07

DATUM UITGEREIK
DATE ISSUED

1996-05-14

UITGEREIK OP GESAG VAN DIE DIREKTEUR-GENERAAL: BINNELANDSE SAKE

ISSUED BY AUTHORITY OF THE DIRECTOR-GENERAL: HOME AFFAIRS

Appendix 3: Agricultural Specialist Study

Appendix 3: Ecological Specialist Study

A VEGETATION AND FAUNAL ASSESSMENT OF FOUR SITES WITHIN THE PHASE 3 AREA ON PORTION 2 OF THE FARM KRAAN VOGEL KUIL No. 50, PEARSTON.

N.H.G. Jacobsen
Ecological Consultant
P.O. Box 671
WILDERNESS 6560

INTRODUCTION

At the request of Dr M. Cohen of the firm CEN Integrated Environmental Management Unit a survey and assessment of the vegetation and fauna of four areas on Portion 2 of the Farm Kraan Vogel Kuil totaling 138 ha was undertaken over the period 5-8 December 2011.

Description of the Site

The four areas lie east of the R337, Areas 2 and 4 between the latter and Waterford Road and Areas 1 and 3 east of the latter, on both sides and adjacent to two parallel powerlines which traverse the area NW to SE.

The terrain is undulating with low stony ridges and outcrops of plinthite with shallow often gravelly soils interspersed by flats where soils are deeper. No drainage lines intercept these areas, the ground falling off to drainage lines to the south and north.

Apart from service tracks along each powerline other anthropogenic impacts include farm tracks and windpump, a dam and watering points for the livestock, mostly sheep. In the flats south of Area s 3 and 4 rows of *Agave americana* have been planted.

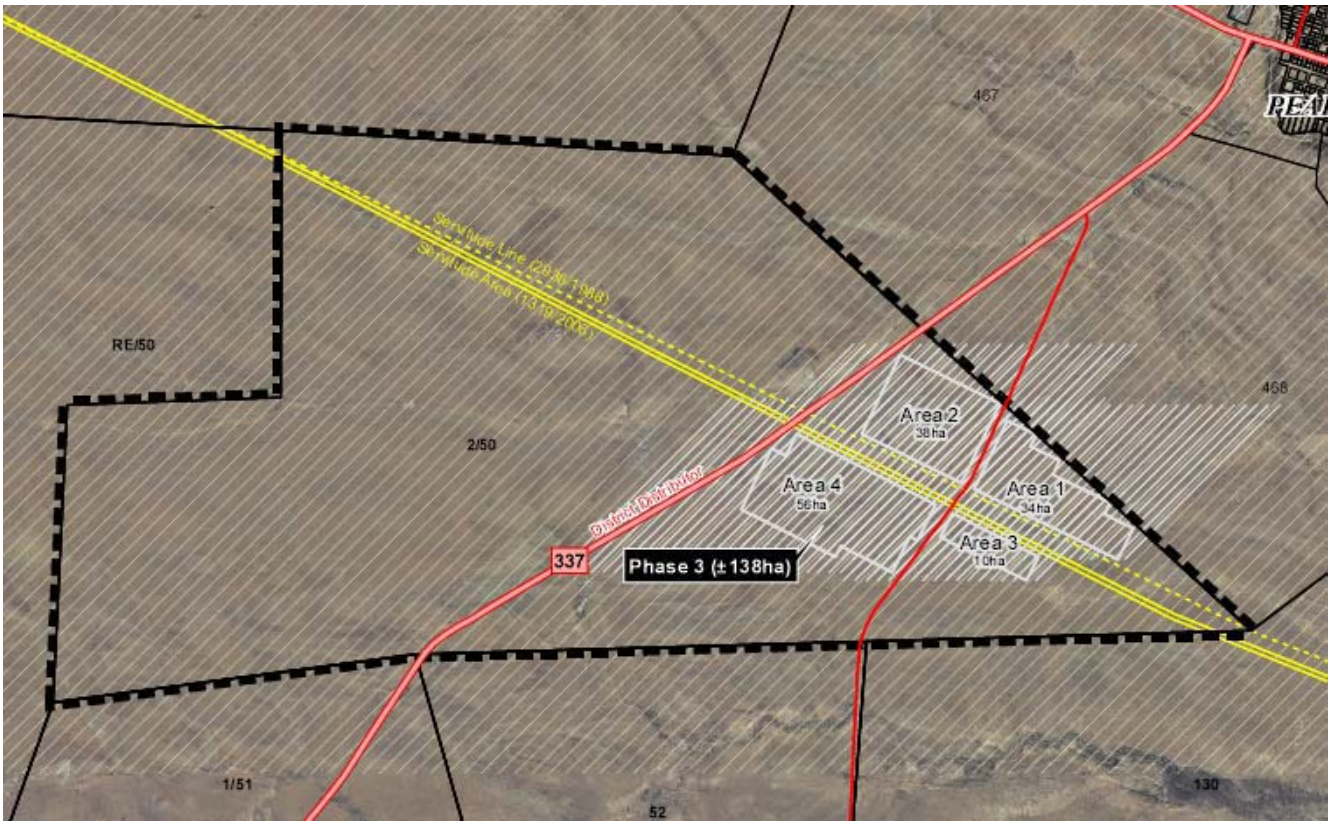
The vegetation on the site is mostly low shrubs and some grass with scattered taller shrubs and small bushclumps in the more rocky areas.

Sheet erosion was visible throughout the areas, with pedestals forming around the base of plants. Many areas were sparsely vegetated as a result.

METHODS

Four transects in each area (Area 1 to 4 – refer to map below) were traversed on foot by two person and vegetation recorded on a tape recorder for later

transcription. Lists of the fauna seen or deduced as being present were compiled and augmented from the literature according to the condition of the area.



RESULTS
Vegetation

According to Mucina & Rutherford (2006) the area falls within the Nama Karoo Biome in Vegetation Type NKl 2 or Eastern Lower Karoo. This is characterized by a low to middle-height microphyllous shrubland with grasses more prevalent in places. Plants regarded as typical for this vegetation type included trees such as *Acacia karoo*, with tall shrubs represented by *Lycium cinereum, L. oxycarpum, L. schizocalyx, Cadaba aphylla, Carissa bispinosa (haematocarpa), Grewia robusta* and *Rhigozum obovatum*. Low shrubs included *Eriocephalus ericoides, Aptosimum elongatum, Pentzia incana, Rosenia humilis, Felicia muricata, Chrysocoma ciliata, Garuleum latifolium, Asparagus striatus, A. suaveolens, Barleria pungens, Blepharis mitrata, Euryops anthemoides, Hermannia cuneifolia, Microloma armatum, Pegolettia retrofracta* and *Indigofera sessilifolia* amongst others.

Succulent shrubs included *Ruschia cradockensis, Astroloba foliolosa, Crassula corallina, Drosanthemum lique, D. subspinosum, Euphorbia ferox, Mestoklema*

tuberosum, Rhombophyllum nelii, Pachypodium succulentum, Sarcocaulon camdeboense and *Trichodiadema barbatum*.

Grasses included *Aristida adscensionis, A. congesta, A. diffusa, Cynodon incompletus, Eragrostis lehmanniana, E. obtusa, Enneapogon desvauxii, Tragus berteronianus, T. koelerioides* and *T. racemosus*.

Herbs including succulents are comprised of species such as *Chamaesyce inaequilatera, Convolvulus sagittatus, Gazania krebsiana, Tribulus terrestris, Crassula muscosa, Senecio radicans, Mesembryanthemum coriarium* and *M. articulatum* with geophytes including *Albuca setosa, Drimia anomala, D. intricata* and *Moraea polystachya*.

Many of these were recorded on site and a total of 148 species are incorporated in Table 1. Although the vegetation cover was basically similar for the four areas, each differed in some respects from the others. A brief description of the vegetation of each site follows.

AREA 1 (34ha)

The vegetation comprised a mixture of grass and shrubs mostly < 30 cm tall with scattered taller shrubs of *Rhigozum obovatum* and bushclumps comprised of *Carissa bispinosa, Diospyros lycioides, D. austro-africana, Lycium oxycarpum* and *Ehretia rigida.*

Low shrubs were mixed with *Pentzia incana, Helichrysum rosum, H. zeyheri, Plinthus karooicus, Aptosimum procumbens, Asparagus suaveolens, A. striatus, A. mucronatus, Sarcocaulon camdeboense, Euryops anthemoides, Pteronia staehelinoides, P. incana, Pegolettia retrofracta* and *Lycium* spp. among others recorded.

Forbs were widespread including *Blepharis mitrata, Felicia muricata, Commelina africana, Sutera campanulata, Heliophila suavissima, Sansiveria aethiopica, Bulbine frutescens* including both yellow and white flowering forms, *Selago geniculata* and *Jamesbrittenia tysonii*.
Geophytes were common including *Ammocharis coranica, Cyrtanthus helictus, Albuca setosa, Drimia anomala, Ledebouria floribunda, Ornithogalum juncifolium* and *O. tenuifolium.*

Succulents were common including *Euphorbia ferox*, mesembs such as *Ruschia cradockensis, Duvalia sp., Pachypodium succulentum, Aloe ferox, Astroloba foliolosa,Othonna sedifolia, Adromischus subdistichus, Drosanthemum sp., Mestoklema tuberosum, Mesembryanthemum coriarium, M. splendens, M. sp., Ruschia intricata* and *Crassula* spp.

Grasses were sparse, mostly *Tragus koelerioides* and *Aristida diffusa*.

Figure 1. A view across a stony part of Area 1. The larger shrubs are Rhigozum obovatum, typical of such terrain with scattered grass tussocks and smaller shrubs.

A total of 87 species were recorded in this area (Table 1), some of which were not recorded on the other sites such as *Diospyros austro-africana, Ehretia rigida, Commelina africana* and *Lycium oxycarpum*.

Area 2. (38ha)

Much of this area was stony characterized by the presence of *Rhigozum obovatum* and small bushclumps typically comprised of *Carissa bispinosa, Grewia robusta, Gymnosporia buxifolia, Cadaba aphylla, Searsia gueinzii* and *Sansevieria aethiopica*. Away from the stony areas the vegetation was dominated by low shrubs, principally *Pentzia incana* but also other species such as *Helichrysum rosum, Sarcocaulon camdeboense, Euphorbia ferox, Lycium sp., Asparagus suaveolens, A. striatus, Barleria pungens, Hermannia cuneifolia,*

Pegolettia retrofracta, Thesium hystrix, Pteronia staehelinoides together with some grass, *Aristida congesta* and *A. diffusa*.

Geophytes are common including *Cyrtanthus helictus, Ornithogalum juncifolium, O. tenuifolium, O. sp. cf thyrsoides, Dipcadi viride, Drimia anomala* and *Ledebouria floribunda.*

Figure 2. Note the sparse vegetation cover in parts of Area 2 with lower plant species richness and dominance of Ankerkaroo *Pentzia incana* (grey shrubs in the background).

Succulents were also common including four mesemb species as well as *Chasmatophyllum musculinum*, *Anacampseros arachnoides, Duvalia sp. cf parviflora. Pachypodium succulentum, Haworthia nigra* and several *Crassula* spp.

A total of 82 plant species were recorded from this site (Table 1), the lowest of the four areas assessed but including *Asparagus africanus, Indigofera* sp., *Digitaria eriantha, Duvalia sp. cf parviflora* and *Viscum rotundifolium* which were not recorded at the other sites.

Area 3 (10ha)

Figure 3. A view across the vegetation of Area 3, with almost a complete absence of grasses except for *Tragus koelerioides* in the middle foreground. *Agave americana* grew mostly along the southern margin of the site.

Like that of the previous sites Area 3 was mostly dominated by low shrubs < 30 cm tall but taller species sparsely distributed on the site mostly in stony areas adjacent to the powerline. Although the species composition of the vegetation was also similar it differed mostly in the paucity of grasses with the exception of ruderal species such as *Tragus koelerioides*. Other species only recorded in this area include *Asparagus sp. cf exuvialis, Aloe claviflora, Arctotheca calendula, Opuntia ficus-indica, Cotyledon campanulata, Lessertia annularis, Dipcadi ciliare, Crassula expansa, Psilocaulon* sp. and *Hypertelis salsoloides* (both the latter shared with Area 1)

A total of 87 species were recorded in this area, which despite the smaller size exhibited substantial plant species richness (Table 1).

Area 4 (56ha)

Figure 4. View across the vegetation of Area 4, predominantly comprised of low shrubs including many succulents.

This is the largest of the four areas surveyed and also exhibited the highest number of species (103, Table 1). The vegetation was essentially similar to that of the other areas with low shrubs < 30 cm tall predominating on the flats with deeper soils and taller shrubs occurring primarily along low rocky or stony ridges and slopes. Shrubs in such rocky and stony areas were more widely spaced. Thirteen species were only recorded on this site including *Asparagus exuvialis, Aloe longistyla, Berkheya glabrata, Eriospermum sp., Acacia karroo, Marsilea burchellii, Faucaria bosscheana, Pharnaceum sp., Portulaca foliosa, Selago alba, Ornithogalum sp.,* unid. mesemb and *Hermannia coccocarpa* (Table 1). Grasses were common including *Aristida diffusa, A. congesta* (often moribund)*, Eragrostis lehmanniana* and *E. obtusa*.

Red Data Species

One of the species recorded, *Duvalia parviflora* is listed as Vulnerable ((Raimondo, Van Staden, Foden, Victor, Helme, Turner, Kamundi & Manyama eds, 2009) and several species are endemic to the Eastern Cape Province such as *Cyrtanthus helictus, Drimia anomala, Euphorbia ferox, Mestoklema tuberosum* and *Trichodiadema barbatum*.

Fauna

Due to the proximity of the areas to one another and the similarity of the vegetation and habitats recorded, the fauna is here described as being representative of all the sites. Tables 2-4 list the species recorded or deduced as occurring in the area as well as from the literature.

Although birds were the most commonly seen or heard, few species were recorded such as Clapper Lark *Mirafra apiata*, Spike-heeled Lark *Chersomanes albofasciata*, Blue Crane *Anthropoides paradisea*, Pale Chanting Goshawk *Melierax canorus*, Amur Falcon *Falco amurensis*, Southern Black Korhaan *Eupodotis afra*, Black Crow *Corvus capensis* and Egyptian Goose *Alopochen aegyptiacus*. Table 2 lists species recorded and which could occur or forage in the area, some of which are rare and threatened (Barnes 2000).

Few reptiles were seen, mostly lizards including the Spotted Sand Lizard *Pedioplanis lineoocellata*, Variegated Skink *Trachylepis variegata* as well as the Angulate Tortoise *Chersina angulata*. Table 3 lists the species seen and likely to occur, none of which are considered threatened (Branch 1988).

No amphibian species were seen but the Bubbling Kassina *Kassina senegalensis* was heard calling away from the area. Table 3 lists the species which may occur, none of which are rare or threatened (Minter, Burger, Harrison, Braack, Bishop & Kloepfer eds. 2004).

Apart from a Round-eared Elephant Shrew *Macroscelides proboscideus*, Grey Duiker *Sylvicapra grimmia* and a solitary Black Wildebeest *Connochaetes gnu* no other mammal was observed but signs of several species such as Aardvark *Orycteropus afer*, Porcupine *Hystrix africae-australis,* Common Molerat *Cryptomys hottentotus* and Ground Squirrel *Xerus inauris* were seen. Table 4 list the species considered likely to occur or forage in the area.

Red Data Species

Apart from birds such as Blue Crane and Ludwig's Bustard *Neotis ludwigii* listed as Vulnerable together with the Secretary Bird *Sagittarius serpentarius* and Lanner Falcon *Falco biarmicus* listed as Near Threatened (Barnes 2000), no other rare or threatened species of fauna are considered likely to occur or forage in the area (Minter et al 2004, Friedmann & Daly 2006).

- **Table 1: List of Plants Recorded (RDB: Red Data Book Status, END: Eastern Cape Endemic, A1 to 4 refers to areas sampled as per layout plan).**

SPECIES					
Family Acanthaceae	END	A1	A2	A3	A4
Barleria pungens			x		x
Blepharis mitrata		x	x	x	x
Family Agavaceae					
Agave americana *				x	x
Family Aizoaceae					
Galenia sp. cf sarcophylla		x	x	x	x
Hypertelis salsoloides					x
Plinthus karooicus		x			x
Family Amaryllidaceae					
Ammocharis coranica		x	x	x	x
Cyrtanthus sp. cf helictus	x	x	x	x	
Family Anacardiaceae					
Searsia (Rhus) gueinzii			x		x
Family Apocynaceae					
Carissa bispinosa		x	x		x
Duvalia modesta	x		x		x
Duvalia sp. cf parviflora		x			
Pachypodium succulentum		x	x	x	x
Family Asparagaceae					
Asparagus striatus		x	x	x	x
Asparagus suaveolens		x	x	x	x
Asparagus africanus			x		
Asparagus exuvialis					x
Asparagus mucronatus		x		x	x
Asparagus sp. (scandent)		x	x		x
Asparagus sp. (dwarf, flower)		x	x	x	x
Asparagus sp. (dwarf, zigzag)				x	

Family Asphodelaceae					
Aloe claviflora				x	
Aloe ferox		x			x
Aloe longistyla					x
Astroloba foliolosa		x		x	x
Bulbine abyssinica					
Bulbine frutescens		x	x	x	x
Haworthia nigra			x		x
Family Asteraceae					
Arctotheca calendula				x	x
Berkheya glabrata					x
Chrysocoma ciliata		x	x		x
Cuspidia cernua		x		x	x
Eriocephalus ericoides		x	x	x	x
Euryops anthemoides		x	x	x	x
Felicia filifolia			x		
Felicia muricata		x	x	x	x
Felicia ovata		x	x	x	x
Gazania krebsiana		x	x	x	x
Gnaphalium sp. cf undulatum					x
Helichrysum rosum var arcuatum		x	x	x	x
Helichrysum zeyheri		x	x	x	x
Ifloga glomerata		x	x	x	x
Oncosiphon pilulifera			x		
Othonna sedifolia		x		x	
Pegolettia retrofracta		x	x		
Pentzia globosa			x		
Pentzia incana		x	x	x	x
Pteronia incana		x	x	x	x
Pteronia staehelinoides		x	x		x
Pteronia sp.		x		x	
Senecio inaequidens		x			
Senecio radicans		x		x	x
Family Bignoniaceae					
Rhigozum obovatum		x	x	x	x
Family Boraginaceae					
Ehretia rigida		x			
Family Brassicaceae					

Heliophila suavissima		x		x	x
Lepidium sp. cf trifurcum		x	x	x	x
Family Cactaceae					
Opuntia ficus-indica *				x	
Family Capparaceae					
Cadaba aphylla		x	x	x	x
Family Celastraceae					
Gymnosporia buxifolia		x	x	x	x
Family Commelinaceae					
Commelina africana		x			
Family Crassulaceae					
Adromischus subdistichus		x			
Cotyledon campanulata				x	
Crassula corallina		x	x		x
Crassula expansa				x	
Crassula muscosa		x	x	x	x
Crassula subulata complex		x	x	x	x
Crassula capitella complex (congested)	x?	x	x	x	x
Crassula capitella complex (pyramid)	x?	x		x	x
Family Cucurbitaceae					
Cucumis zeyheri				x	
Family Cyperaceae					
Cyperus capensis		x	x	x	
Family Dracaenaceae					
Sansevieria aethiopica		x	x	x	x
Family Ebenaceae					
Diospyros austro-africana		x			
Diospyros lycioides		x	x		x
Euclea undulata			x		

Family Eriospermaceae					
Eriospermum sp.					x
Family Euphorbiaceae					
Euphorbia ferox	x	x	x	x	x
Euphorbia rhombifolia		x	x	x	x
Family Fabaceae					
Acacia karroo					x
Indigofera alternans					x
Indigofera sessilifolia				x	x
Indigofera sp.			x		
Lessertia sp. cf annularis				x	
Lotononis sp.		x	x	x	x
Fanily Geraniaceae					
Sarcocaulon camdeboense		x	x	x	x
Family Hyacinthaceae					
Albuca setosa		x	x		x
Albuca sp.			x	x	
Dipcadi ciliare				x	
Dipcadi viride			x	x	x
Drimia anomala	x	x	x	x	
Ledebouria floribunda		x	x	x	x
Ornithogalum tenuifolium		x	x	x	
Ornithogalum juncifolium		x	x	x	
Ornithogalum thyrsoides			x	x	
Ornithogalum sp. 2					x
Family Iridaceae					
Moraea sp.		x	x	x	x
Family Marsileaceae					
Marsilea sp. cf burchellii					x
Family Mesembryanthemaceae					
Chasmatophyllum sp. cf musculinum			x		x
Drosanthemum sp. cf parvifolium		x	x	x	x
Faucaria sp. cf bosscheana	x				x

Mesembryanthemum coriarium		x		x	
Mesembryanthemum noctiflorum		x			x
Mesembryanthemum splendens				x	x
Mesembryanthemum sp. (flat leaves)					x
Mesembryanthemum sp. (Psilocaulon)		x		x	
Mestoklema tuberosum	x	x		x	x
Ruschia cradockensis		x	x	x	x
Trichodiadema barbatum	x	x	x	x	x
Unid. Mesemb (red)					x
Family Molluginaceae					
Hypertelis salsoloides		x		x	
Pharnaceum sp.					x
Family Poaceae					
Aristida congesta ssp. barbicollis		x	x	x	x
Aristida diffusa		x	x	x	x
Cynodon sp. cf incompletus					x
Digitaria eriantha			x		
Eragrostis curvula					x
Eragrostis lehmanniana		x	x	x	x
Eragrostis obtusa		x	x	x	x
Eragrostis sp.					x
Oropetium capense		x	x	x	x
Sporobolus fimbriatus		x		x	x
Tragus koelerioides		x	x	x	x
Family Portulacaceae					
Anacampseros arachnoides		x	x	x	x
Portulaca foliosa					x
Family Santalaceae					
Thesium hystrix			x	x	x
Family Scrophulariaceae					
Aptosimum procumbens		x	x	x	x
Jamesbrittenia tysonii		x	x	x	x
Nemesia sp. cf anisocarpa		x	x	x	x
Sutera campanulata		x	x	x	x
Sutera halimifolia		x	x		x
Family Selaginaceae					

Selago alba					x
Selago geniculata		x	x	x	x
Family Solanaceae					
Lycium cinereum		x	x	x	x
Lycium oxycarpum		x			
Lycium sp. (dwarf)			x	x	
Solanum tomentosum				x	x
Family Sterculiaceae					
Hermannia cuneifolia		x	x	x	x
Hermannia filifolia				x	
Hermannia vestita		x		x	x
Hermannia coccocarpa					x
Family Tiliaceae					
Grewia robusta			x		x
Family Typhaceae					
Typha capensis					x
Family Viscaceae					
Viscum rotundifolium			x		
TOTAL = 142 species		87	82	87	103
* denotes alien species					

- **Table 2: List of Avifuana Recorded (Rec) and/or likely to occur on site (RDB: Red Data Book status)**

SPECIES	COMMON NAME	Rec	RDB
Ardea melanocephala	Black-headed Heron		
Ciconia ciconia	White Stork		
Alopochen aegyptiacus	Egyptian Goose	x	
Anas undulata	Yellow-billed Duck		
Hieraaetus pennatus	Booted Eagle		
Buteo buteo	Steppe Buzzard		
Elanus caeruleus	Black-shouldered Kite		
Melierax canorus	Pale Chanting Goshawk	x	
Milvus parasitus	Yellow-billed Kite		
Falco biarmicus	Lanner Falcon		NT
Falco rupicoloides	Greater Kestrel		

Falco amurensis	Eastern Red-footed Kestrel	x	
Sagittarius serpentarius	Secretarybird		NT
Coturnix coturnix	Common Quail	x	
Anthropoides paradisea	Blue Crane	x	VU
Neotis ludwigii	Ludwig's Bustard		VU
Eupodotis vigorsii	Karoo Korhaan		
Eupodotis afra	Southern Black Korhaan	x	
Three-banded Plover	Three-banded Plover		
Vanellus coronatus	Crowned Plover		
Vanellus armatus	Blacksmith Plover		
Burhinus capensis	Spotted Dikkop		
Rhinoptilus africanus	Double-banded Courser		
Pterocles namaqua	Namaqua Sandgrouse		
Streptopelia capicola	Cape Turtle Dove		
Oena capensis	Namaqua Dove		
Bubo africanus	Spotted Eagle Owl		
Colius colius	White-backed Mousebird		
Lybius leucomelas	Acacia Pied Barbet		
Chersomanes albofasciata	Spike-heeled Lark	x	
Certhilauda curvirostris	Long-billed Lark		
Mirafra apiata	Clapper Lark	x	
Galerida magnirostris	Thick-billed Lark		
Calandrella cinerea	Red-capped Lark		
Hirundo cucullata	Greater Striped Swallow		
Hirundo rustica	Barn Swallow		
Corvus capensis	Black Crow	x	
Corvus albus	Pied Crow		
Parus afer	Southern Grey Tit		
Cercomela sinuata	Sickle-winged Chat		
Cercomela schlegelii	Karoo Chat		
Myrmecocichla formicivora	Southern Ant-eating Chat		
Erythropygia coryphaeus	Karoo Robin		
Anthoscopus minutus	Cape Peduline Tit		
Stenoscira scita	Fairy Flycatcher		
Cisticola subruficapilla	Grey-backed Cisticola		
Prinia maculosa	Spotted Prinia		
Melaenornis infuscatus	Chat Flycatcher		
Malcorus pectoralis	Rufous-eared Warbler		
Motacilla capensis	Cape Wagtail		
Lanius collaris	Fiscal Shrike		
Spreo bicolor	Pied Starling		
Serinus flaviventris	Yellow Canary		
Serinus albogularis	White-throated Canary		
Serinus alario	Black-headed Canary		

- **Table 3: List of herpetofauna recorded (Rec) and/or likely to occur on site**

Amphibia		Rec
Xenopus laevis	Common Platanna	
Amietophrynus gariepensis	Karoo Toad	
Cacosternum boettgeri	Common Caco	
Tomopterna tandyi	Tandy's Sand Frog	
Kassina senegalensis	Bubbling Kassina	x
Reptilia		
Chersina angulata	Angulate Tortoise	x
Psammobates t. tentorius	Tent Tortoise	
Pelomedusa subrufa	Helmeted Terrapin	x
Pseudaspis cana	Mole Snake	
Prosymna s. sundevallii	Sundevall's Shovel-snout	
Psammophis notostictus	Karoo Sand Snake	
Dasypeltis scabra	Common Egg-eater	
Homoroselaps lacteus	Spotted Harlequin Snake	
Aspidelaps lubricus	Coral Snake	
Naja nivea	Cape Cobra	
Bitis a. arietans	Puff Adder	
Trachylepis capensis	Cape Skink	
Trachylepis variegata	Variegated Skink	x
Pedioplanis l. lineo-ocellata	Spotted Sand Lizard	x
Agama a. aculeata	Ground Agama	x
Pachydactylus capensis	Cape Thick-toed Gecko	
Pachydactylus maculatus	Spotted Thick-toed Gecko	

- **Table 4: List of mammals recorded (Rec) and/or likely to occur on site.**

SPECIES	COMMON NAME	Rec.
Lepus saxatilis	Scrub Hare	x
Macroscelides rhomboideus	Round -eared Elephant Shrew	x
Ictonyx striatus	Striped Polecat	
Canis mesomelas	Black-backed Jackal	
Genetta genetta	Small-spotted Genet	
Felis nigripes	Black-footed Cat	
Caracal caracal	Caracal	
Hystrix africae-australis	Porcupine	x
Xerus inauris	Cape Ground Squirrel	
Cryptomys hottentotus	Common Molerat	x
Desmodillus auricularis	Short-tailed Gerbil	

Gerbillurus paeba	Hairy-footed Gerbil	
Mastomys natalensis	Natal Multimammate Mouse	
Pedetes capensis	Springhare	
Orycteropus afer	Aardvark	x
Raphicerus campestris	Steenbok	x
Sylvicapra grimmia	Grey Duiker	x
Connochaetus gnu	Black Wildebeest	x

DISCUSSION

The vegetation of the area is still in a relatively undisturbed state with few anthropogenic impacts and exhibits substantial species richness. It is unlikely in a single visit that a complete checklist of the vegetation could be achieved. Several geophytes had finished flowering and were senescent while others were only starting to flower. Nevertheless the checklist represents the greatest percentage of taxa occurring in the areas under existing landuse practices. The vegetation has been subjected to overgrazing with the result that species composition has changed from its original state. This is manifest in the bare areas occurring between vegetation tufts and clumps and the paucity of perennial grasses and the abundance of annual and perennial sour grasses. Some of these such as *Aristida congesta* and *Tragus koelerioides* are ruderals, increasing under disturbed conditions. Sheet erosion is present throughout the area although most evident away from rocky and gravelly soils, promoting pedestal development and the presence of flow lines. Area 4 appears to have the best soil cover while areas 1 and 3 are the poorest.

The number of species recorded for three of the sites is similar despite the small size of Area 3, but was substantially more for Area 4. This could be ascribed to the larger area of the latter despite the vegetation and topography appearing superficially similar. This is substantiated by the far larger number of species (13) only recorded at the latter. However Area 3 stands out as having disproportionately higher species richness than the other sites.

Acocks (1975) regarded the vegetation type of the Camdebo plains as Veld Type 37, False Karroid Broken Veld, a poor derivative of the original vegetation cover of an open grassy shrub savanna, marginal to Spekboomveld and scrub of the lower mountain slopes as a result of having been invaded by Central Lower Karoo and Karroid Broken Veld, following erosion after the destruction of the grass cover. Although this may have affected plant species richness, what remains is still substantial.

The area falls within the Albany Centre of Endemism (Van Wyk & Smith 2001) rich in endemic succulents and non-succulents, some of which have been recorded in the areas surveyed. These include *Euphorbia ferox, Rhombophyllum sp., Mestoklema tuberosum, Cyrtanthus helictus, Drimia anomala* and *Duvalia modesta*. Two forms of the *Crassula capitella* complex also appear to be

endemic and may represent undescribed forms or species, while the occurrence of what appears to be *Duvalia parviflora,* is a new record for the Eastern Cape and far removed from the nearest record in the Little Karoo between Ladismith and Oudtshoorn. It is listed as Vulnerable in the Red List of South African Plants 2009 (Raimondo et al 2009) due to habitat loss from agricultural practices.

The peculiarly shaped *Duvalia parviflora* (left) and an undescribed *Crassula* sp., part of the *Crassula capitella* complex (right)

At present there is a lack of specifications for the proposed development which makes it difficult to predict what the effect on the vegetation is likely to be. If it follows that of other similar solar power developments, it is likely that most, if not all of the terrain inspected will be utilized with the result that most of the vegetation will be destroyed. In this event it may be possible to rescue at least the large numbers of succulents and geophytes which occur in the areas, and make these available for relocation and to universities, botanical gardens, collectors and nurseries.

Additional effects include substantial runoff following downpours which may take place from time to time and the periodic washing of the solar panels to remove accumulated dust. Not only will this affect the growth of the receiving vegetation and change species composition but it could increase erosion unless remedial measures are put in place. Such measures could include subterranean rainwater tanks into which rainwater and other runoff could be funneled for re-use.

The fauna of the area appears to be poor, in part perhaps due to anthropogenic activities such as predator control. Few species were recorded but many others are expected to occur or be transient through the areas (Tables 2-4). The development will be detrimental to the fauna, not only will it result in a reduction in habitat and foraging area but construction and maintenance activities will have a wider disturbance effect and road mortalities will increase. In addition an altered vegetation structure and composition resulting from excessive rainfall runoff from the development could attract species currently not resident in the area.

Few rare and threatened species are present, these limited to the avifauna. Species which will be most affected are Blue Crane which were recorded foraging adjacent to Area 3, as well as Ludwig's Bustard. It was also noticed that the current powerlines are not fitted with avian avoidance devices, which may have resulted in mortalities of both these species, in particular the latter. According to Barnes (2000) these pose the most serious threat to these species in the eastern Karoo resulting in a mortality rate of one bird/ km/ annum in the case of Ludwig's Bustard. It is imperative that appropriate marking devices be put in place as well as on any new distribution and transmission lines which may arise from the development.

CONCLUSION

In conclusion the areas surveyed still exhibit substantial plant species richness, including a large succulent component. One species, *Duvalia parviflora* is regarded as threatened and two *Crassula* sp. may be undescribed. Some of the species recorded are protected by legislation. It is likely that the type of development will destroy much of the vegetation on site and perhaps result in excessive runoff following downpours, exacerbating erosion as well as altering the vegetation composition surrounding the sites. Some mitigation is possible once the full measure of impacts can be ascertained.
Although the fauna on the sites is relatively poor the presence of threatened species is indicative of the importance of the area. Apart from the destruction of habitat the development will affect the utilization of the area by the fauna and result in higher mortalities.

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Appendix 4: Ecological Specialist Study

A PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 55 MEGAWATT SOLAR FARM AND ASSOCIATED INFRASTRUCTURE ON PORTION 2 OF THE FARM KRAAN VOGEL KUIL NO. 50, PEARSTON, BLUE CRANE MUNICIPALITY, EASTERN CAPE PROVINCE

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CONTENTS

A PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 55 MEGAWATT SOLAR FARM AND ASSOCIATED INFRASTRUCTURE ON PORTION 2 OF THE FARM KRAAN VOGEL KUIL NO. 50, PEARSTON, BLUE CRANE MUNICIPALITY, EASTERN CAPE PROVINCE

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Note: This report follows the minimum standard guidelines required by the South African Heritage Resources Agency for compiling Archaeological Heritage Phase 1 Impact Assessment (AHIA) reports.

SUMMARY

Proposal

The original proposal was to conduct a phase 1 archaeological impact assessment of the proposed construction site for a 55 megawatt solar farm and associated infrastructure on Portion 2 of the Farm Kraan Vogel Kuil No. 50, Pearston, Blue Crane Municipality, Eastern Cape Province. The survey was conducted to establish the range and importance of possible exposed and *in situ* archaeological sites/materials, the potential impact of the development and to make recommendations to minimize possible damage.

The location of the development

The proposed 55 megawatt solar farm development is situated approximately 2.2 kilometres west of the town of Pearston. It is located south of the R337 gravel road between Pearston and Jansenville and on both sides of the gravel road to Waterford.

The investigation

Apart from one concentration of Later Stone Age stone tools and occasional Middle and Later Stone Age stone tools no other archaeological sites/materials were observed.

Cultural sensitivity

The proposed property for development is of low archaeological sensitivity. Development may proceed as planned.

Recommendations

1. No solar panels must be constructed within 20 metres of the concentration of Later Stone Age stone tools (GPS reading: 32.36.019S; 25.06.379E).

2. If any concentrations of archaeological material are uncovered during development, it should be reported immediately to the Albany Museum and/or the South African Heritage Resources Agency.

3. Construction managers/foremen should be informed, before construction starts, on the possible types of heritage sites which may be encountered during construction.

PROJECT INFORMATION

Status

The report is part of an Environmental Impact Assessment.

The type of development

The development will include the construction of a 55 megawatt solar farm and associated infrastructure of some 138 hectares in size. No further information is available.

The Developer:

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Terms of reference

To conduct a phase 1 archaeological impact assessment of the proposed construction site for a 55 megawatt solar farm and associated infrastructure on Portion 2 of the Farm Kraan Vogel Kuil No. 50, Pearston, Blue Crane Municipality, Eastern Cape Province. The survey was conducted to establish;

- the range and importance of possible exposed and *in situ* archaeological sites, features and materials,
- the potential impact of the development on these resources and,
- to make recommendations to minimize possible damage to these resources.

BRIEF ARCHAEOLOGICAL BACKGROUND

Literature review

Little is known about the archaeology of the Pearston area because no systematic research or regional surveys/recordings have been conducted. There are a few reports of faded rock paintings and stone tools in the Bruintjies Hoogte Mountains to the east of Pearston. The closest and one of the most complete archaeological surveys in South Africa was conducted in the Agter Sneeuberg region in the central and upper Seacow River Area some 200 km north-

west (Sampson 1985). The only systematic survey and recording in the immediate vicinity was conducted in the Mountain Zebra National Park (Brooker 1974) and Deacon (1976) excavated Highlands Rock Shelter some 50-60 km to the north-east. Sampson's, Brooker's, and Deacon's research and surveys, together with records/collections of the Albany Museum, provide the background information for compiling an archaeological time sequence for the region.

The oldest evidence for occupation of the region are stone artefacts (small hand axes, sidescrapers and flakes) from the Earlier Stone Age, known as the 'final' Acheulian Industry which date older than 200 000 years. Excavations at the Cradock springs in the town yielded a number of these stone tools (Opperman pers. comm.). Sampson (1985) located a large number of sites and there is also a collection in the Albany Museum from the Cradock and Graaff Reinet area. Middle Stone Age (MSA) artefacts (long blades and points) are found throughout the region, but because these are found in the open it is difficult to know where they fit into the cultural time sequence. At Highlands Rock Shelter MSA stone tools, possibly a Howieson's Poort Industry, was dated older than 30 000 years (Deacon 1976). Sampson on the other hand reported many open-air MSA sites which he assigned to the Orangian Industry (dating between 128 000 - 75 000 years old), Florisbad and Zeekoegat Industries dating between 64 000 and 32 000 years old.

Without the aid of radiocarbon dating in the past, all Later Stone Age (LSA) assemblages were classified into three phases using mainly scrapers shape and size, namely, Smithfield A, large circular scrapers, Smithfield B, long, narrow end scrapers (both manufactured of black hornfels) and Smithfield C, small thumbnail scrapers (manufactured of chalcedonies and agates) (Goodwin and Van Riet Lowe 1929). When radiocarbon dating became available many years later it indicated that there were no sites which date between 9 500 and 4 600 years old for the drier inland plateaux (Deacon 1974). The LSA deposits at Highlands Rock Shelter date to 4 500 years old (Deacon 1976). Today the term Smithfield is only used for stone tool assemblages with backed bladelets and long end scrapers dating within the last 1000 years and replaces the term Smithfield B (Sampson 1988). The term Smithfield A has been replaced by Oakhurst and Smithfield C by Interior or Post-Wilton. Oakhurst is similar to the Albany Industry in the adjacent Cape Mountains, dating between 10 500 and 8 000 years old and also replaces the previously termed Lockshoek Industry (Sampson 1985).

The survey of the Mountain Zebra National Park (Brooker 1974) confirmed that the area is rich in archaeological remains and that some of the LSA time sequence for the region was present, as well as rock art. Unfortunately no rock engravings were found to compare with that of Samekoms, but there is another engraved and painted site listed in the Albany Museum records, only a few kilometres away. Unfortunately, apart from the stone tools, little else is preserved and it is not possible to reconstruct subsistence patterns. Better preservation of organic material at Highlands Rock Shelter provides some insight into hunter-gatherer subsistence in the area. Collecting of underground plant remains such as *Cyperus usitatus* and *Freezia corymbrosa* would appear to have been an important food source together with the hunting of mountain zebra/quagga, mountain reedbuck, warthog and various small antelope such as duiker, klipspringer and steenbok. Also listed in the museum records are freshwater shell middens along the banks of the Great Fish River and small quantities of crab and freshwater mussel were also found in the excavations. Many stock enclosures with stone walls and fragments of sand-tempered ceramic vessels are found throughout the Seacow River area and are most probably associated with Khoi pastoralists who settled in the area during the past 1 000 years.

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Relevant impact assessments

Binneman, J. 2011. A phase 1 archaeological impact assessment for the proposed construction of a 10 megawatt solar farm near Pearston, Blue Crane Municipality, Eastern Cape Province. Prepared for CEN Integrated Environmental Management Unit, Port Elizabeth.

DESCRIPTION OF THE PROPERTY

Area Surveyed

Location data

The proposed area for the construction of a 55 megawatt solar farm is situated approximately 2.2 kilometres west of Pearston, Blue Crane Municipality, Eastern Cape Province. It is located on the farm Kraan Vogel Kuil No. 50, between (south) the gravel roads to Jansenville (R337) and on both sides of the road to Waterford (Maps 1-2).

Map

1:50 000 3225 CA Pearston

ARCHAEOLOGICAL INVESTIGATION

Methodology and results

Due to the large size of the site it was unfeasible to do a complete survey. However, most of the area was investigated by two people on foot and from a vehicle, which provided an insight and understanding of the status of the archaeology of the area. GPS readings were taken with a Garmin and all important features were digitally recorded. The proposed area for development comprised of natural Karroo veld and is situated on a relatively flat plain. The immediate surrounds have been disturbed in the past by the construction of power and telephone lines, fencing and the usual small scale farming activities. The terrain is zoned for agricultural activities and comprised of orange brown alluvial soil covered by sparsely to dense low grass, shrubs and *euphorbia ferrox* vegetation. The underlying hard rock is exposed in places (Figs 1-6). In general the surface visibility was good, but surprisingly few archaeological sites/materials were observed.

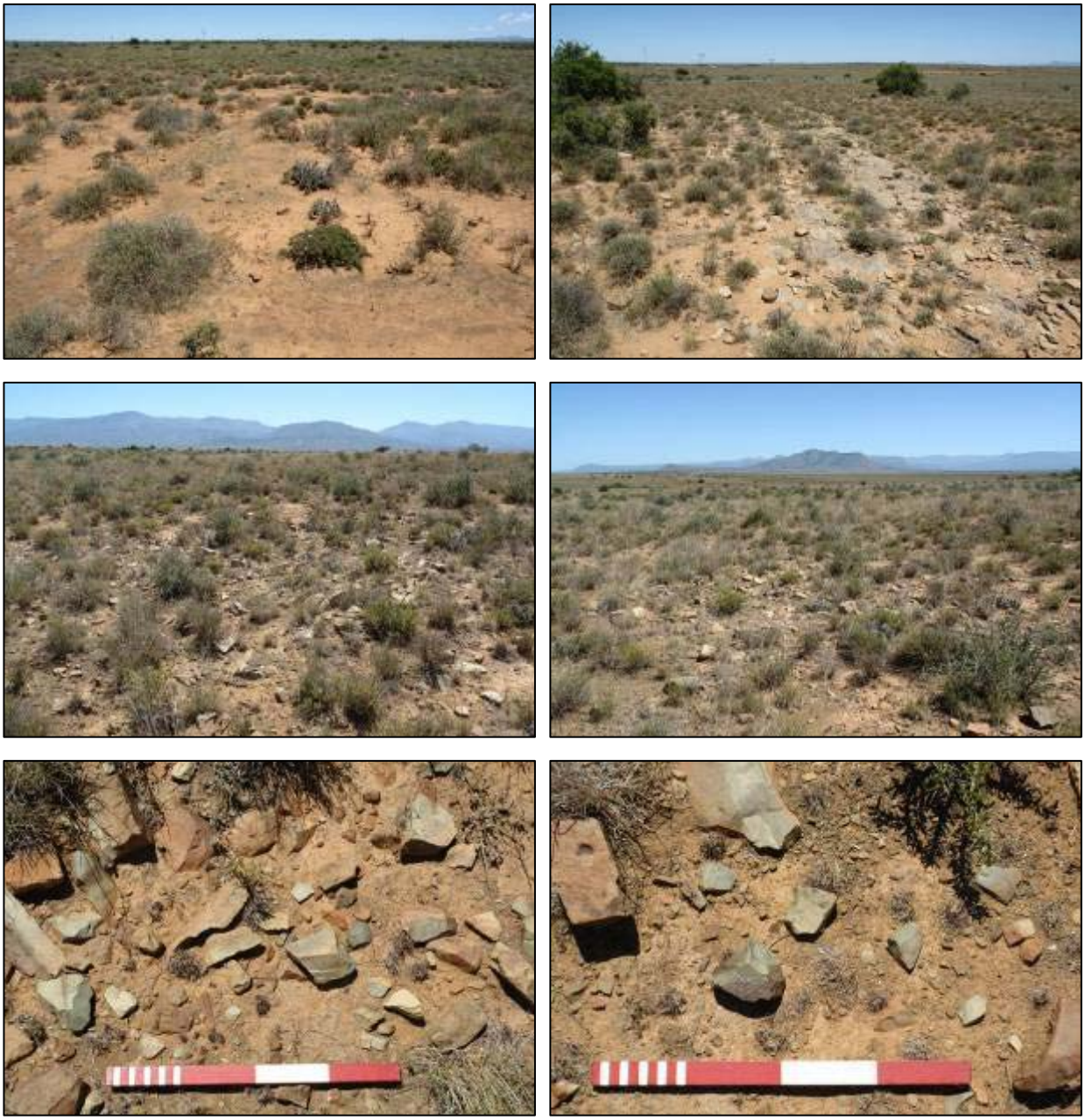
The criteria follow for a ‘recordable/representative archaeological site’, was a minimum of 4 stone tools (and/or other material, such as bone, beads, shell) per square metre. This size for a

representative site was increased from one to four square metres when it turned out that the general area was not well presented by archaeological sites/materials. Occasional Middle Stone Age (older that 30 000 years) and Later Stone Age (younger than 30 000 years) stone tools were observed throughout the area investigated. Nevertheless, it is possible that concentrations of such materials may be covered by soil and vegetation.

Only one small area was observed with more than 4 stone tools per four square metres. The site measured approximately 10 x 10 metres and was situated on the western side of a ridge with a good view of the surrounding area (GPS reading: 32.36.019S; 25.06.379E). Several cores, flakes, chunks and retouched/utilised stone tools produced from grey/greenish fine grained sandstone were observed scattered within this small area (Figs 7-10). There were no other archaeological materials associated with the stone tools.

There are no graves or buildings older than 60 years. In general it would appear that it is unlikely that any sensitive archaeological remains will be exposed during the development. The area is of low cultural sensitivity and the proposed development may proceed.

Figs 1-6. Different views of the proposed site for the construction of a 55 megawatt solar farm.



Figs 1-6. General views of the proposed site for the construction of a 55 megawatt solar farm, orange brown alluvial soil (top left), exposed hard rock (top right) wide-angle views of the concentration of Later Stone Age stone artefacts (middle row) and close-up views of the stone tools – cores and flakes manufactured from grey/greenish fine grained sandstone (bottom row).

ASSESSMENT OF THE IMPACTS

Pre-colonial archaeology

Nature of the impacts

From the investigation, it would appear that the proposed solar facility site is of low archaeological sensitivity. Apart from one small area where a number of Later Stone Age stone artefacts were exposed on an outcrop of hard rock, no other significant sites/materials were observed. The occasional stone tools observed throughout the area are of low cultural significance, but material may be covered by soil and grass. The main impact to archaeological

sites/remains (if any) will be the physical disturbance of the material and its context. The construction of the solar panels, cabling between the panels and access roads may expose, disturb and displace archaeological sites/material.

Extent of the impacts

Construction of the solar panels, cabling between the panels and access roads may impact on remains which are buried, but these impacts will be limited and restricted to the local area. The construction of the solar panels may disturb small areas and the negative impact on possible archaeological sites/materials may be relatively small. Other projects such as the construction of roads, buildings and underground lines will disturb large areas and may expose sites/materials on a larger scale. In both cases further disturbances of sites/materials can be limited by mitigation.

Table 1. Impacts on the pre-colonial archaeology.

Nature: The potential impact of the construction of the solar panels, cabling between the panels, and access roads on above and below ground archaeology.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (4)	Permanent (4)
Magnitude	Minor (2)	Minor (2)
Probability	Unlikely (2)	Unlikely (2)
Significance	Low < 20	Low < 20
Status (positive or negative)	Negative	Neutral
Reversibility	No	No
Irreplaceable loss of resources?	No, but in some cases, yes	No
Can impacts be mitigated?	Yes	
Mitigation It is proposed that no solar panels be constructed within 20 metres of the concentration of Later Stone Age stone tools (GPS reading: 32.36.019S; 25.06.379E). No mitigation is proposed for the rest of the property before construction starts because the archaeological remains (if any) are of low significance (excluding human remains). However, if concentrations of archaeological materials are exposed then all work must stop for an archaeologist to investigate (see below). If any human remains (or any other concentrations of archaeological heritage material) are exposed during construction, all work must cease and it must be reported immediately to the nearest museum/archaeologist or to the South African Heritage Resources Agency, so that a systematic and professional investigation can be undertaken. Sufficient time should be allowed to investigate and to remove/collect such material. Recommendations will follow from the investigation.		
Cumulative impacts: n/a		
Residual impacts: n/a		

Pre-colonial archaeological cultural landscape

Nature of the impact

The archaeological significance of the area is low and therefore the visual impact of the solar facility on the cultural landscape will be low as well. The development is relatively far removed from any major towns, highways and there are no historical buildings, graves or other features of importance on or near the site. Due to size of the solar panels they will have little visual impact on the landscape and 'sense of place'.

Extent of impact

The visual impact of the solar panels will be restricted to the immediate area of the development and will have little negative effect on the cultural landscape and 'significance/sense of place'. Notwithstanding, the 'presence' of the solar panels will be long term to permanent, but negative impacts can be mitigated.

Table 2. Impacts on the pre-colonial cultural landscape.

Nature: The potential impact of the construction of the solar panels, cabling between the panels, and access roads on the cultural landscape and 'sense of place'.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term/permanent (4)	Long term/permanent(4)
Magnitude	Minor (2)	Minor (2)
Probability	Unlikely (2)	Unlikely (2)
Significance	Low < 20	Low < 20
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	yes
Mitigation No mitigation is proposed because the archaeological remains are of low significance.		
Cumulative impacts The cumulative impacts will only increase if further solar facilities are planned for adjoining areas, which may bring changes to the pre-colonial cultural landscape in terms of visual impacts and changes to 'sense of place'.		
Residual impacts: n/a		

DISCUSSION AND MITIGATION

The proposed solar facility site on the farm Kraan Vogel Kuil No. 50, Pearston, is of low archaeological significance. Apart from one small concentration of Later Stone Age stone artefacts, no other significant sites/materials were observed. The occasional Middle and Later Stone Age stone tools observed throughout the area are of low cultural of significance, but material may be covered by soil and grass. Due to the size of the solar panels the visual impact on the surrounding cultural landscape will be low. Although it is unlikely that any sensitive

archaeological remains will be exposed during the development, there is always a possibility that human remains and/or other archaeological and historical material may be uncovered during the development. It is recommended that;

1. No solar panels must be constructed within 20 metres of the concentration of Later Stone Age stone tools (GPS reading: 32.36.019S; 25.06.379E). The area must be fenced-off during the construction phase to prevent any accidental disturbance of the site.

2. If any concentrations of material are uncovered during development, it should be reported to the Albany Museum and/or the South African Heritage Resources Agency immediately so that systematic and professional investigation/excavations can be undertaken. Sufficient time should be allowed to remove/collect such material (See appendix B for a list of possible archaeological sites that maybe found in the area).

3. Construction managers/foremen should be informed, before construction starts, on the possible types of heritage sites which may be encountered during construction.

GENERAL REMARKS AND CONDITIONS

Note: This report is a phase 1 archaeological impact assessment/investigation only and does not include or exempt other required heritage impact assessments (see below).

The National Heritage Resources Act (Act No. 25 of 1999, section 35) (see Appendix A) requires a full Heritage Impact Assessment (HIA) in order that all heritage resources, that is, all places or objects of aesthetics, architectural, historic, scientific, social, spiritual linguistic or technological value or significance are protected. Thus any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures older than 60 years, living heritage, historical settlements, landscapes, geological sites, palaeontological sites and objects.

It must be emphasised that the conclusions and recommendations expressed in this archaeological heritage sensitivity investigation are based on the visibility of archaeological sites/features and may not therefore, reflect the true state of affairs. Many sites/features may be covered by soil and vegetation and will only be located once this has been removed. In the event of such finds being uncovered, (such as during any phase of construction work), archaeologists must be informed immediately so that they can investigate the importance of the sites and excavate or collect material before it is destroyed. The onus is on the developer to ensure that this agreement is honoured in accordance with the National Heritage Act No. 25 of 1999.

It must also be clear that Archaeological Specialist Reports (AIA's) will be assessed by the relevant heritage resources authority. The final decision rests with the heritage resources authority, which should grant a permit or a formal letter of permission for the destruction of any cultural sites.

APPENDIX A: brief legislative requirements

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(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
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Burial grounds and graves

36. (3) (a) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—
(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
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38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorized as –

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
(b) the construction of a bridge or similar structure exceeding 50m in length;
(c) any development or other activity which will change the character of the site –
(i) exceeding 5000m^2 in extent, or
(ii) involving three or more erven or subdivisions thereof; or
(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA, or a provincial resources authority;
(d) the re-zoning of a site exceeding 10 000m^2 in extent; or
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APPENDIX A: IDENTIFICATION OF ARCHAEOLOGICAL FEATURES AND MATERIAL FROM INLAND AREAS: guidelines and procedures for developers

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They come in different forms and sizes, but are easy to identify. The most common are roughly circular stone walls (mostly collapsed) and may represent stock enclosures, remains of wind breaks or cooking shelters. Others consist of large piles of stones of different sizes and heights and are known as *isisivane.* They are usually near river and mountain crossings. Their purpose and meaning is not fully understood, however, some are thought to represent burial cairns while others may have symbolic value.

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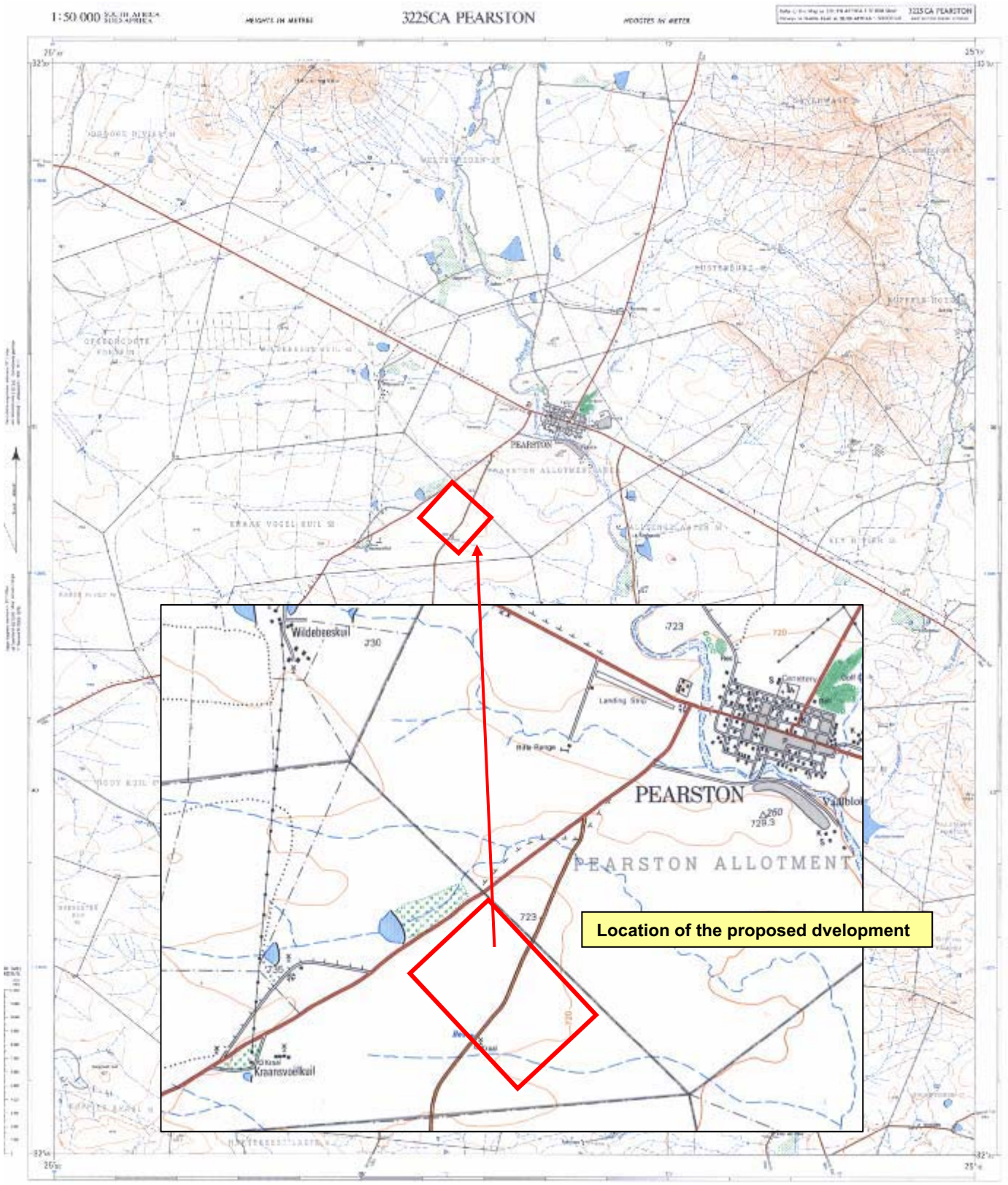
These are difficult for the layman to identify. However, large accumulations of flaked stones which do not appear to have been distributed naturally should be reported. If the stone tools are associated with bone remains, development should be halted immediately and archaeologists notified.

Fossil bone

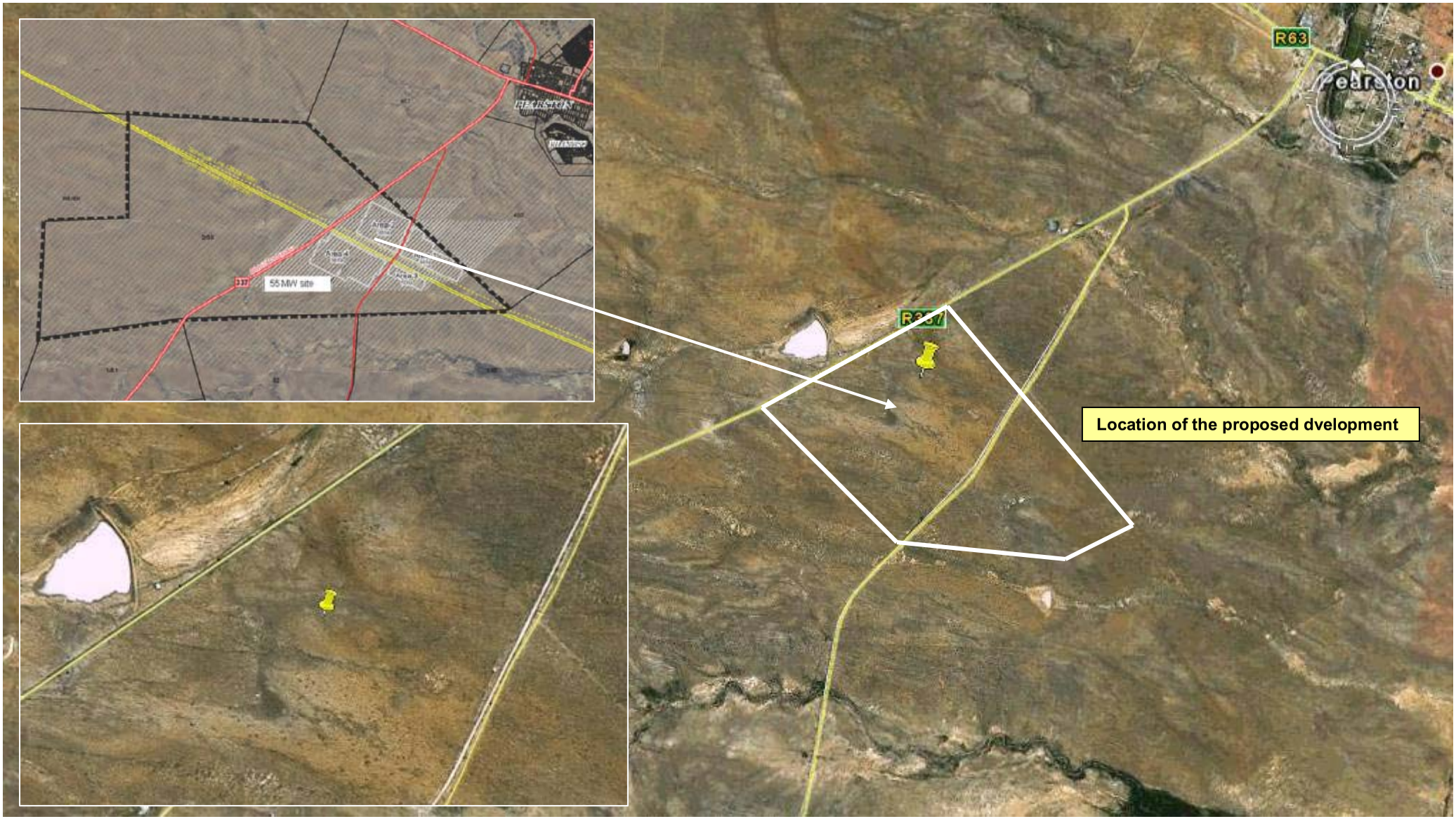
Fossil bones may be found embedded in geological deposits. Any concentrations of bones, whether fossilized or not, should be reported.

Historical artefacts or features

These are easy to identify and include foundations of buildings or other construction features and items from domestic and military activities**.**



Map 1. 1:50 000 Maps indicating the location of the proposed development of a 55 megawatt solar farm. The red squares mark the approximate size of the site.



Map 2. Aerial images indicating the location of the proposed development of a 55 megawatt solar farm. The yellow peg marks the Later Stone Age stone tool concentration and the white lines mark the approximate size of the site (insert map courtesy CEN Integrated Environmental Management Unit).

Appendix 5: Level 1 Archaeological Impact Assessment

A PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 55 MEGAWATT SOLAR FARM AND ASSOCIATED INFRASTRUCTURE ON PORTION 2 OF THE FARM KRAAN VOGEL KUIL NO. 50, PEARSTON, BLUE CRANE MUNICIPALITY, EASTERN CAPE PROVINCE

Prepared for: CEN Integrated Environmental Management Unit
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Compiled by: Dr Johan Binneman
On behalf of: Eastern Cape Heritage Consultants
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Date: Januarie 2012

CONTENTS

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Compiled by: Dr Johan Binneman
On behalf of: Eastern Cape Heritage Consultants
P.O. Box 689
Jeffreys Bay, 6330
Tel: 042 2960399
Cell: 0728006322

Note: This report follows the minimum standard guidelines required by the South African Heritage Resources Agency for compiling Archaeological Heritage Phase 1 Impact Assessment (AHIA) reports.

SUMMARY

Proposal

The original proposal was to conduct a phase 1 archaeological impact assessment of the proposed construction site for a 55 megawatt solar farm and associated infrastructure on Portion 2 of the Farm Kraan Vogel Kuil No. 50, Pearston, Blue Crane Municipality, Eastern Cape Province. The survey was conducted to establish the range and importance of possible exposed and *in situ* archaeological sites/materials, the potential impact of the development and to make recommendations to minimize possible damage.

The location of the development

The proposed 55 megawatt solar farm development is situated approximately 2.2 kilometres west of the town of Pearston. It is located south of the R337 gravel road between Pearston and Jansenville and on both sides of the gravel road to Waterford.

The investigation

Apart from one concentration of Later Stone Age stone tools and occasional Middle and Later Stone Age stone tools no other archaeological sites/materials were observed.

Cultural sensitivity

The proposed property for development is of low archaeological sensitivity. Development may proceed as planned.

Recommendations

1. No solar panels must be constructed within 20 metres of the concentration of Later Stone Age stone tools (GPS reading: 32.36.019S; 25.06.379E).

2. If any concentrations of archaeological material are uncovered during development, it should be reported immediately to the Albany Museum and/or the South African Heritage Resources Agency.

3. Construction managers/foremen should be informed, before construction starts, on the possible types of heritage sites which may be encountered during construction.

PROJECT INFORMATION

Status

The report is part of an Environmental Impact Assessment.

The type of development

The development will include the construction of a 55 megawatt solar farm and associated infrastructure of some 138 hectares in size. No further information is available.

The Developer:

Imveloyethu Power Company (Pty) Ltd

The Consultant

CEN Integrated Environmental Management Unit
36 River Road
Walmer
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6070
Tel: 041 5812983
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Contact person: Dr M. Cohen
email: steenbok@aerosat.co.za

Terms of reference

To conduct a phase 1 archaeological impact assessment of the proposed construction site for a 55 megawatt solar farm and associated infrastructure on Portion 2 of the Farm Kraan Vogel Kuil No. 50, Pearston, Blue Crane Municipality, Eastern Cape Province. The survey was conducted to establish;

- the range and importance of possible exposed and *in situ* archaeological sites, features and materials,
- the potential impact of the development on these resources and,
- to make recommendations to minimize possible damage to these resources.

BRIEF ARCHAEOLOGICAL BACKGROUND

Literature review

Little is known about the archaeology of the Pearston area because no systematic research or regional surveys/recordings have been conducted. There are a few reports of faded rock paintings and stone tools in the Bruintjies Hoogte Mountains to the east of Pearston. The closest and one of the most complete archaeological surveys in South Africa was conducted in the Agter Sneeuberg region in the central and upper Seacow River Area some 200 km north-

west (Sampson 1985). The only systematic survey and recording in the immediate vicinity was conducted in the Mountain Zebra National Park (Brooker 1974) and Deacon (1976) excavated Highlands Rock Shelter some 50-60 km to the north-east. Sampson's, Brooker's, and Deacon's research and surveys, together with records/collections of the Albany Museum, provide the background information for compiling an archaeological time sequence for the region.

The oldest evidence for occupation of the region are stone artefacts (small hand axes, sidescrapers and flakes) from the Earlier Stone Age, known as the 'final' Acheulian Industry which date older than 200 000 years. Excavations at the Cradock springs in the town yielded a number of these stone tools (Opperman pers. comm.). Sampson (1985) located a large number of sites and there is also a collection in the Albany Museum from the Cradock and Graaff Reinet area. Middle Stone Age (MSA) artefacts (long blades and points) are found throughout the region, but because these are found in the open it is difficult to know where they fit into the cultural time sequence. At Highlands Rock Shelter MSA stone tools, possibly a Howieson's Poort Industry, was dated older than 30 000 years (Deacon 1976). Sampson on the other hand reported many open-air MSA sites which he assigned to the Orangian Industry (dating between 128 000 - 75 000 years old), Florisbad and Zeekoegat Industries dating between 64 000 and 32 000 years old.

Without the aid of radiocarbon dating in the past, all Later Stone Age (LSA) assemblages were classified into three phases using mainly scrapers shape and size, namely, Smithfield A, large circular scrapers, Smithfield B, long, narrow end scrapers (both manufactured of black hornfels) and Smithfield C, small thumbnail scrapers (manufactured of chalcedonies and agates) (Goodwin and Van Riet Lowe 1929). When radiocarbon dating became available many years later it indicated that there were no sites which date between 9 500 and 4 600 years old for the drier inland plateaux (Deacon 1974). The LSA deposits at Highlands Rock Shelter date to 4 500 years old (Deacon 1976). Today the term Smithfield is only used for stone tool assemblages with backed bladelets and long end scrapers dating within the last 1000 years and replaces the term Smithfield B (Sampson 1988). The term Smithfield A has been replaced by Oakhurst and Smithfield C by Interior or Post-Wilton. Oakhurst is similar to the Albany Industry in the adjacent Cape Mountains, dating between 10 500 and 8 000 years old and also replaces the previously termed Lockshoek Industry (Sampson 1985).

The survey of the Mountain Zebra National Park (Brooker 1974) confirmed that the area is rich in archaeological remains and that some of the LSA time sequence for the region was present, as well as rock art. Unfortunately no rock engravings were found to compare with that of Samekoms, but there is another engraved and painted site listed in the Albany Museum records, only a few kilometres away. Unfortunately, apart from the stone tools, little else is preserved and it is not possible to reconstruct subsistence patterns. Better preservation of organic material at Highlands Rock Shelter provides some insight into hunter-gatherer subsistence in the area. Collecting of underground plant remains such as *Cyperus usitatus* and *Freezia corymbrosa* would appear to have been an important food source together with the hunting of mountain zebra/quagga, mountain reedbuck, warthog and various small antelope such as duiker, klipspringer and steenbok. Also listed in the museum records are freshwater shell middens along the banks of the Great Fish River and small quantities of crab and freshwater mussel were also found in the excavations. Many stock enclosures with stone walls and fragments of sand-tempered ceramic vessels are found throughout the Seacow River area and are most probably associated with Khoi pastoralists who settled in the area during the past 1 000 years.

References

Brooker, M. 1977. The archaeology of the Mountain Zebra Park. Koedoe 20:77-93.

Deacon, H. J., 1976. Where hunters gathered: a study of Holocene Stone Age people in the Eastern Cape. South African Archaeological Society Monograph Series No. 1.

Deacon, J. 1974. Patterning in the radiocarbon dates for the Wilton/Smithfield complex in southern Africa. The South African Archaeological Bulletin 25:3-18.

Goodwin, A.J.H. & Lowe, C. van Riet. 1929. The Stone Age cultures of South Africa. Annals of the South African Museum.

Sampson, C.G. 1985. Atlas of Stone Age settlements in the Central and Upper Seacow Valley. Memoirs van die Nationale Museum Bloemfontein No.20.

Sampson, C.G. 1988. Stylistic boundaries among mobile hunter-foragers. Washington: Smithsonian Institution Press.

Relevant impact assessments

Binneman, J. 2011. A phase 1 archaeological impact assessment for the proposed construction of a 10 megawatt solar farm near Pearston, Blue Crane Municipality, Eastern Cape Province. Prepared for CEN Integrated Environmental Management Unit, Port Elizabeth.

DESCRIPTION OF THE PROPERTY

Area Surveyed

Location data

The proposed area for the construction of a 55 megawatt solar farm is situated approximately 2.2 kilometres west of Pearston, Blue Crane Municipality, Eastern Cape Province. It is located on the farm Kraan Vogel Kuil No. 50, between (south) the gravel roads to Jansenville (R337) and on both sides of the road to Waterford (Maps 1-2).

Map

1:50 000 3225 CA Pearston

ARCHAEOLOGICAL INVESTIGATION

Methodology and results

Due to the large size of the site it was unfeasible to do a complete survey. However, most of the area was investigated by two people on foot and from a vehicle, which provided an insight and understanding of the status of the archaeology of the area. GPS readings were taken with a Garmin and all important features were digitally recorded. The proposed area for development comprised of natural Karroo veld and is situated on a relatively flat plain. The immediate surrounds have been disturbed in the past by the construction of power and telephone lines, fencing and the usual small scale farming activities. The terrain is zoned for agricultural activities and comprised of orange brown alluvial soil covered by sparsely to dense low grass, shrubs and *euphorbia ferrox* vegetation. The underlying hard rock is exposed in places (Figs 1-6). In general the surface visibility was good, but surprisingly few archaeological sites/materials were observed.

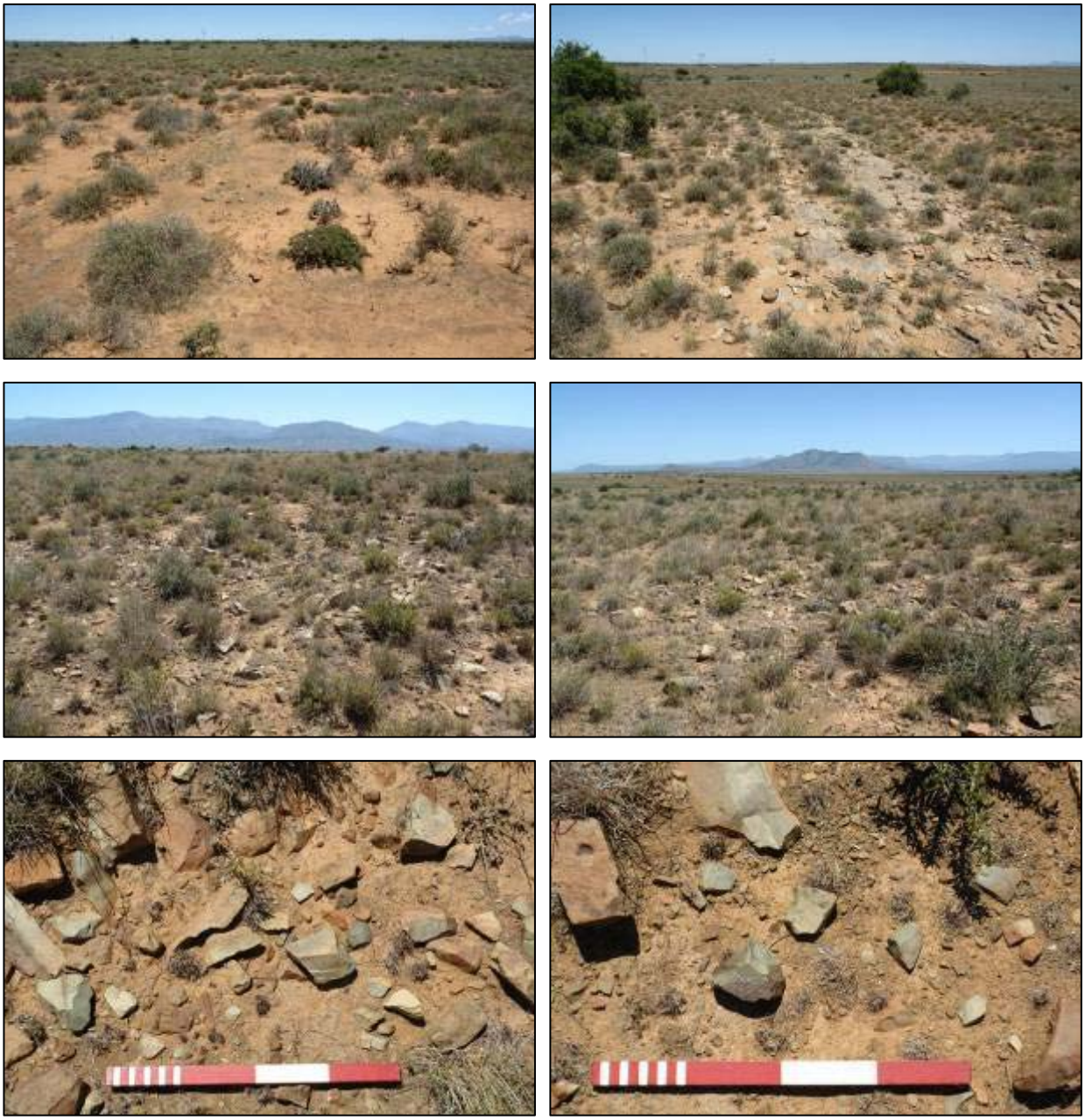
The criteria follow for a ‘recordable/representative archaeological site’, was a minimum of 4 stone tools (and/or other material, such as bone, beads, shell) per square metre. This size for a

representative site was increased from one to four square metres when it turned out that the general area was not well presented by archaeological sites/materials. Occasional Middle Stone Age (older that 30 000 years) and Later Stone Age (younger than 30 000 years) stone tools were observed throughout the area investigated. Nevertheless, it is possible that concentrations of such materials may be covered by soil and vegetation.

Only one small area was observed with more than 4 stone tools per four square metres. The site measured approximately 10 x 10 metres and was situated on the western side of a ridge with a good view of the surrounding area (GPS reading: 32.36.019S; 25.06.379E). Several cores, flakes, chunks and retouched/utilised stone tools produced from grey/greenish fine grained sandstone were observed scattered within this small area (Figs 7-10). There were no other archaeological materials associated with the stone tools.

There are no graves or buildings older than 60 years. In general it would appear that it is unlikely that any sensitive archaeological remains will be exposed during the development. The area is of low cultural sensitivity and the proposed development may proceed.

Figs 1-6. Different views of the proposed site for the construction of a 55 megawatt solar farm.



Figs 1-6. General views of the proposed site for the construction of a 55 megawatt solar farm, orange brown alluvial soil (top left), exposed hard rock (top right) wide-angle views of the concentration of Later Stone Age stone artefacts (middle row) and close-up views of the stone tools – cores and flakes manufactured from grey/greenish fine grained sandstone (bottom row).

ASSESSMENT OF THE IMPACTS

Pre-colonial archaeology

Nature of the impacts

From the investigation, it would appear that the proposed solar facility site is of low archaeological sensitivity. Apart from one small area where a number of Later Stone Age stone artefacts were exposed on an outcrop of hard rock, no other significant sites/materials were observed. The occasional stone tools observed throughout the area are of low cultural significance, but material may be covered by soil and grass. The main impact to archaeological

sites/remains (if any) will be the physical disturbance of the material and its context. The construction of the solar panels, cabling between the panels and access roads may expose, disturb and displace archaeological sites/material.

Extent of the impacts

Construction of the solar panels, cabling between the panels and access roads may impact on remains which are buried, but these impacts will be limited and restricted to the local area. The construction of the solar panels may disturb small areas and the negative impact on possible archaeological sites/materials may be relatively small. Other projects such as the construction of roads, buildings and underground lines will disturb large areas and may expose sites/materials on a larger scale. In both cases further disturbances of sites/materials can be limited by mitigation.

Table 1. Impacts on the pre-colonial archaeology.

Nature: The potential impact of the construction of the solar panels, cabling between the panels, and access roads on above and below ground archaeology.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (4)	Permanent (4)
Magnitude	Minor (2)	Minor (2)
Probability	Unlikely (2)	Unlikely (2)
Significance	Low < 20	Low < 20
Status (positive or negative)	Negative	Neutral
Reversibility	No	No
Irreplaceable loss of resources?	No, but in some cases, yes	No
Can impacts be mitigated?	Yes	
Mitigation It is proposed that no solar panels be constructed within 20 metres of the concentration of Later Stone Age stone tools (GPS reading: 32.36.019S; 25.06.379E). No mitigation is proposed for the rest of the property before construction starts because the archaeological remains (if any) are of low significance (excluding human remains). However, if concentrations of archaeological materials are exposed then all work must stop for an archaeologist to investigate (see below). If any human remains (or any other concentrations of archaeological heritage material) are exposed during construction, all work must cease and it must be reported immediately to the nearest museum/archaeologist or to the South African Heritage Resources Agency, so that a systematic and professional investigation can be undertaken. Sufficient time should be allowed to investigate and to remove/collect such material. Recommendations will follow from the investigation.		
Cumulative impacts: n/a		
Residual impacts: n/a		

Pre-colonial archaeological cultural landscape

Nature of the impact

The archaeological significance of the area is low and therefore the visual impact of the solar facility on the cultural landscape will be low as well. The development is relatively far removed from any major towns, highways and there are no historical buildings, graves or other features of importance on or near the site. Due to size of the solar panels they will have little visual impact on the landscape and 'sense of place'.

Extent of impact

The visual impact of the solar panels will be restricted to the immediate area of the development and will have little negative effect on the cultural landscape and 'significance/sense of place'. Notwithstanding, the 'presence' of the solar panels will be long term to permanent, but negative impacts can be mitigated.

Table 2. Impacts on the pre-colonial cultural landscape.

Nature: The potential impact of the construction of the solar panels, cabling between the panels, and access roads on the cultural landscape and 'sense of place'.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term/permanent (4)	Long term/permanent(4)
Magnitude	Minor (2)	Minor (2)
Probability	Unlikely (2)	Unlikely (2)
Significance	Low < 20	Low < 20
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	yes
Mitigation No mitigation is proposed because the archaeological remains are of low significance.		
Cumulative impacts The cumulative impacts will only increase if further solar facilities are planned for adjoining areas, which may bring changes to the pre-colonial cultural landscape in terms of visual impacts and changes to 'sense of place'.		
Residual impacts: n/a		

DISCUSSION AND MITIGATION

The proposed solar facility site on the farm Kraan Vogel Kuil No. 50, Pearston, is of low archaeological significance. Apart from one small concentration of Later Stone Age stone artefacts, no other significant sites/materials were observed. The occasional Middle and Later Stone Age stone tools observed throughout the area are of low cultural of significance, but material may be covered by soil and grass. Due to the size of the solar panels the visual impact on the surrounding cultural landscape will be low. Although it is unlikely that any sensitive

archaeological remains will be exposed during the development, there is always a possibility that human remains and/or other archaeological and historical material may be uncovered during the development. It is recommended that;

1. No solar panels must be constructed within 20 metres of the concentration of Later Stone Age stone tools (GPS reading: 32.36.019S; 25.06.379E). The area must be fenced-off during the construction phase to prevent any accidental disturbance of the site.

2. If any concentrations of material are uncovered during development, it should be reported to the Albany Museum and/or the South African Heritage Resources Agency immediately so that systematic and professional investigation/excavations can be undertaken. Sufficient time should be allowed to remove/collect such material (See appendix B for a list of possible archaeological sites that maybe found in the area).

3. Construction managers/foremen should be informed, before construction starts, on the possible types of heritage sites which may be encountered during construction.

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It must be emphasised that the conclusions and recommendations expressed in this archaeological heritage sensitivity investigation are based on the visibility of archaeological sites/features and may not therefore, reflect the true state of affairs. Many sites/features may be covered by soil and vegetation and will only be located once this has been removed. In the event of such finds being uncovered, (such as during any phase of construction work), archaeologists must be informed immediately so that they can investigate the importance of the sites and excavate or collect material before it is destroyed. The onus is on the developer to ensure that this agreement is honoured in accordance with the National Heritage Act No. 25 of 1999.

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(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

Burial grounds and graves

36. (3) (a) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—
(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b)any excavation equipment, or any equipment which assists in the detection or recovery of metals.

Heritage resources management

38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorized as –

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
(b) the construction of a bridge or similar structure exceeding 50m in length;
(c) any development or other activity which will change the character of the site –
(i) exceeding 5000m^2 in extent, or
(ii) involving three or more erven or subdivisions thereof; or
(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA, or a provincial resources authority;
(d) the re-zoning of a site exceeding 10 000m^2 in extent; or
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Human remains, whether the complete remains of an individual buried during the past, or scattered human remains resulting from disturbance of the grave, should be reported. In general human remains are buried in a flexed position on their side, but are also found buried in a sitting position with a flat stone capping. Developers are requested to be on alert for the possibility of uncovering such remains.

Freshwater mussel middens

Freshwater mussels are found in the muddy banks of rivers and streams and were collected by people in the past as a food resource. Freshwater mussel shell middens are accumulations of mussel shell and are usually found close to rivers and streams. These shell middens frequently contain stone tools, pottery, bone, and occasionally human remains. Shell middens may be of various sizes and depths, but an accumulation which exceeds 1 m^2 in extent, should be reported to an archaeologist.

Large stone cairns

They come in different forms and sizes, but are easy to identify. The most common are roughly circular stone walls (mostly collapsed) and may represent stock enclosures, remains of wind breaks or cooking shelters. Others consist of large piles of stones of different sizes and heights and are known as *isisivane.* They are usually near river and mountain crossings. Their purpose and meaning is not fully understood, however, some are thought to represent burial cairns while others may have symbolic value.

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These are difficult for the layman to identify. However, large accumulations of flaked stones which do not appear to have been distributed naturally should be reported. If the stone tools are associated with bone remains, development should be halted immediately and archaeologists notified.

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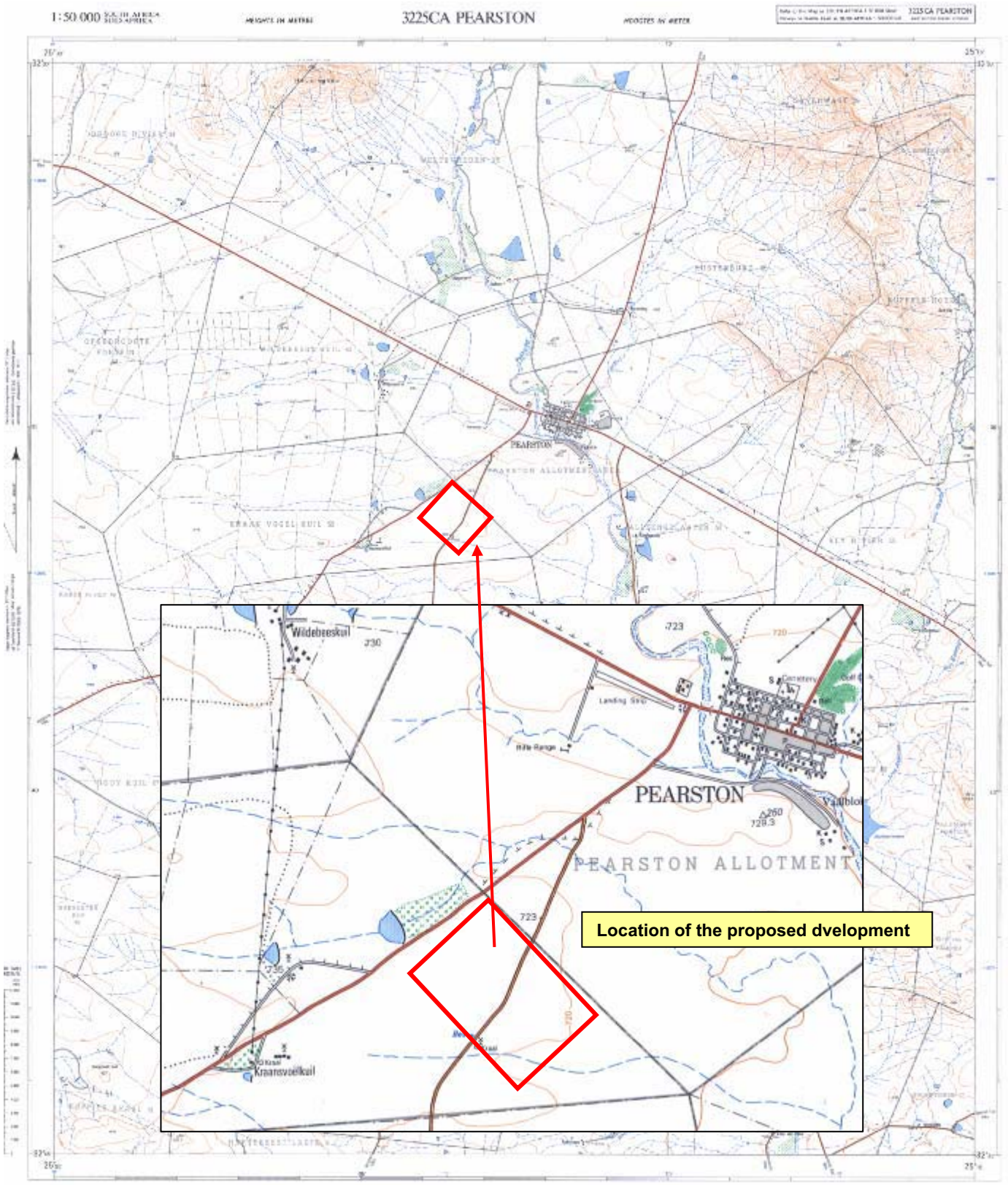
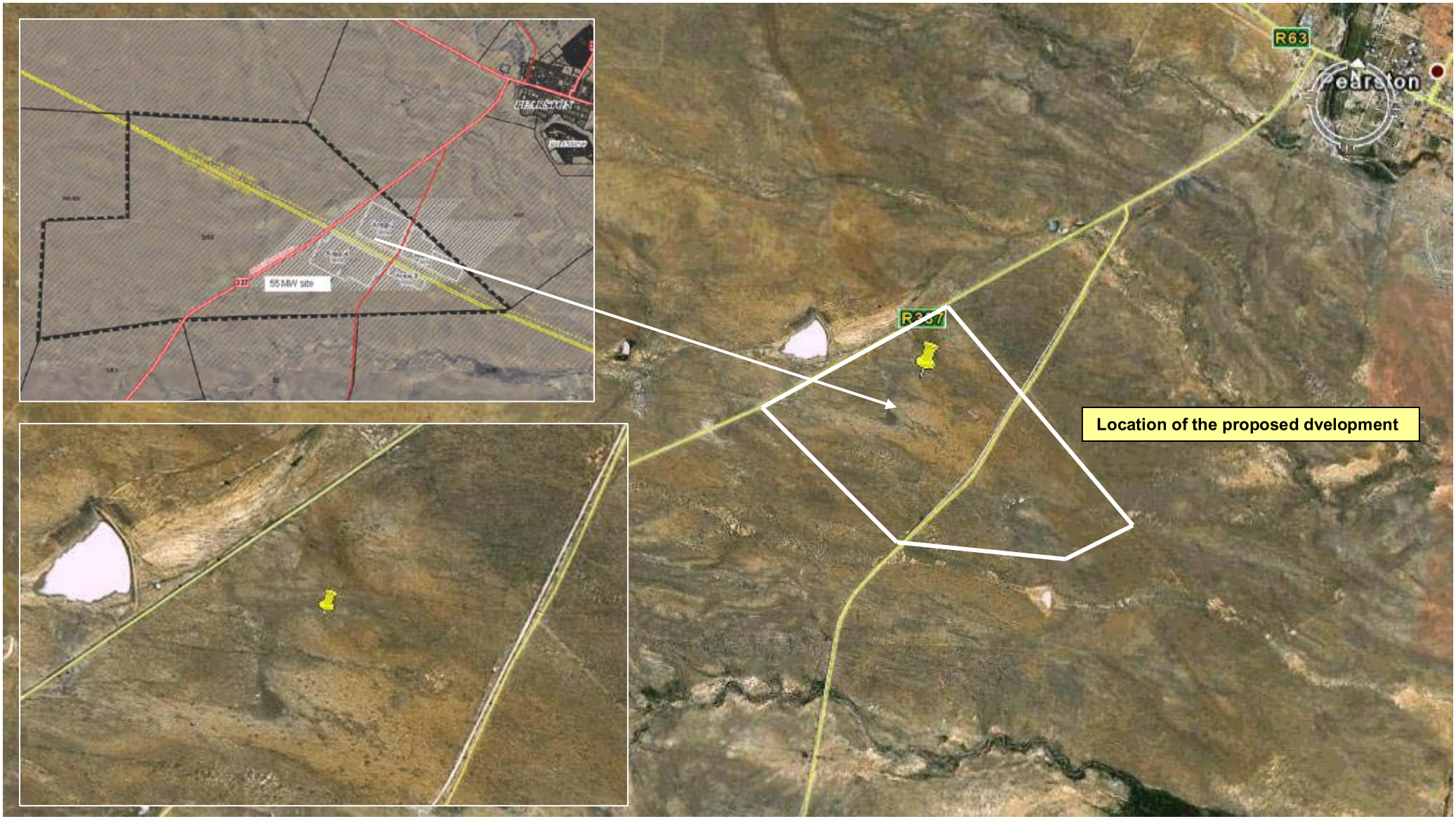
Fossil bones may be found embedded in geological deposits. Any concentrations of bones, whether fossilized or not, should be reported.

Historical artefacts or features

These are easy to identify and include foundations of buildings or other construction features and items from domestic and military activities**.**



Map 1. 1:50 000 Maps indicating the location of the proposed development of a 55 megawatt solar farm. The red squares mark the approximate size of the site.



Map 2. Aerial images indicating the location of the proposed development of a 55 megawatt solar farm. The yellow peg marks the Later Stone Age stone tool concentration and the white lines mark the approximate size of the site (insert map courtesy CEN Integrated Environmental Management Unit).

Visual Impact Assessment

3. Visual Impact Assessment

A. Introduction

CEN Integrated Environmental Management Unit was appointed by BNM Friul Renergy (Propriety) Limited to undertake a Viewshed Assessment for the proposed solar farm development on the Farm Kraanvoëlkuil and Pearston Commonage, Pearston, Eastern Cape.

i. Scope of Work

The scope of the work for the Viewshed Assessment for the proposed development consists of the following elements:

- A viewshed analysis will be conducted to determine the visibility of the proposed development on the Farm Kraanvoëlkuil and Pearston Commonage, Pearston, Eastern Cape, from surrounding view points (including the town of Pearston, surrounding farms and roads).
- Existing developments, conservation areas, infrastructure and tourist facilities in the area will be taken into account in the above-mentioned analyses.
- The above-mentioned analyses will be represented spatially on a series of maps.
- A series of 3D visualisations of the development will be generated for each of the identified viewpoints. The purpose of this is to provide a realistic representation of the impact the proposed development will have on the surrounding landscape.
- A report will be compiled summarising the findings of the above analyses.

ii. Methodology

The methodology followed in conducting the scope of work is outlined as follows:

- Source elevation/relief data and associated spatial information for the study area.
- Build a Digital Elevation Model.
- Select and capture observation points.
- Conduct analysis, including viewshed, and hill-shade analysis.

- Produce 3 dimensional representations of the likely views from selected viewpoints (viewpoints from which the proposed development on the Farm Kraanvoëlkuil and Pearston Commonage, Pearston, Eastern Cape has shown to be visible).
- Interpret the results of the analysis.
- Map production.
- Compilation of report.

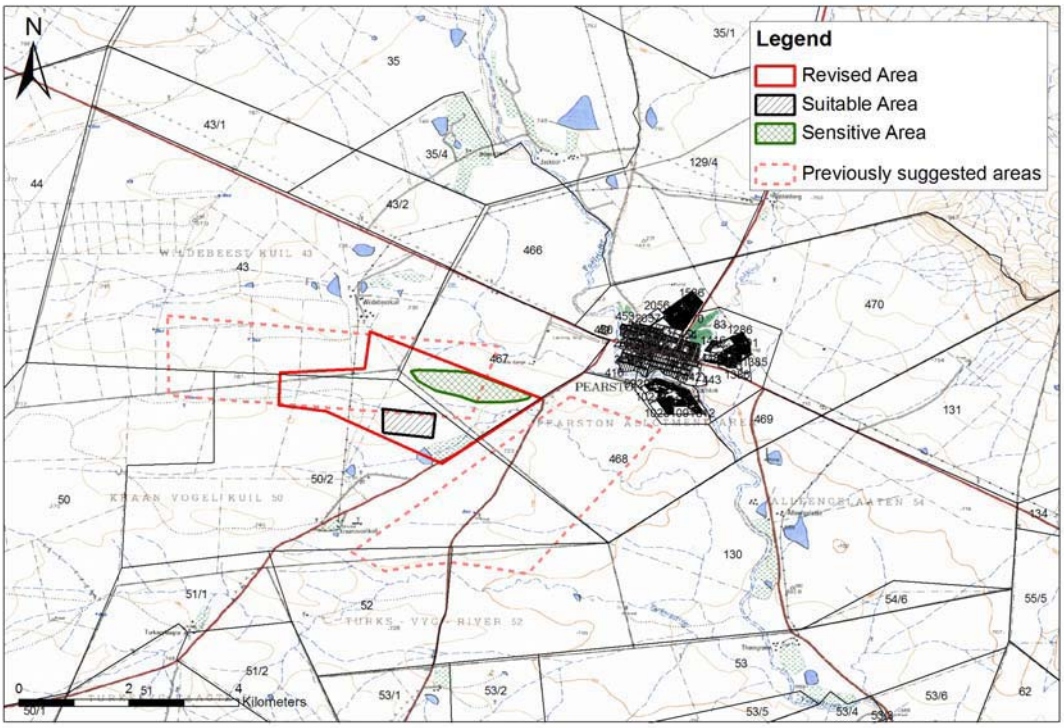
iii. Assumptions and Limitations

- The assessment presented is purely quantitative in nature and does not address qualitative criteria such as aesthetic value or sense of place.
- The analysis focussed on the visibility of the proposed development from the surrounding area.
- The assessment represents the results of a desktop assessment based on industry standard computer aided digital elevation modelling techniques and analysis.

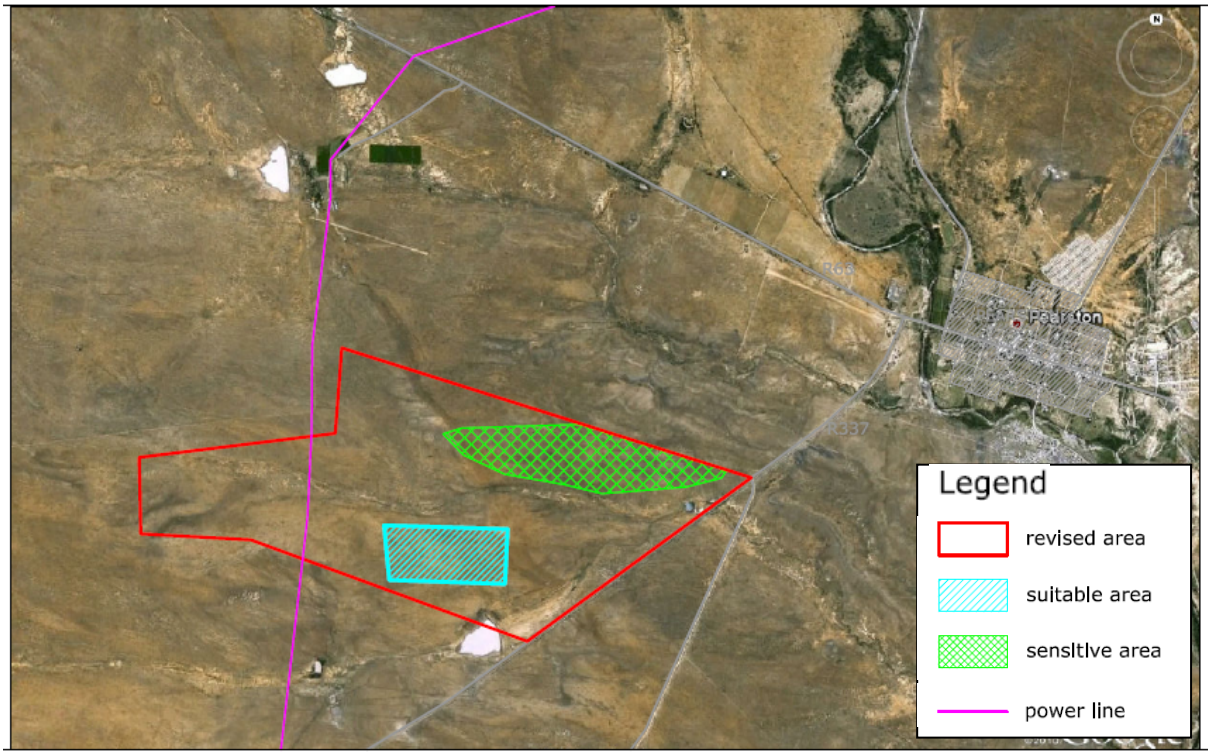
B. Proposed Development

i. Locality

The development site is situated to the south-west of the town of Pearston, south of the R63 and west of the R337 (Figure 9). Surrounding land uses include residential, businesses, agriculture (Figure 10).



➢ **Figure 9: An extract from a 1:50 000 topographical map showing the location of the property (indicated in red).**



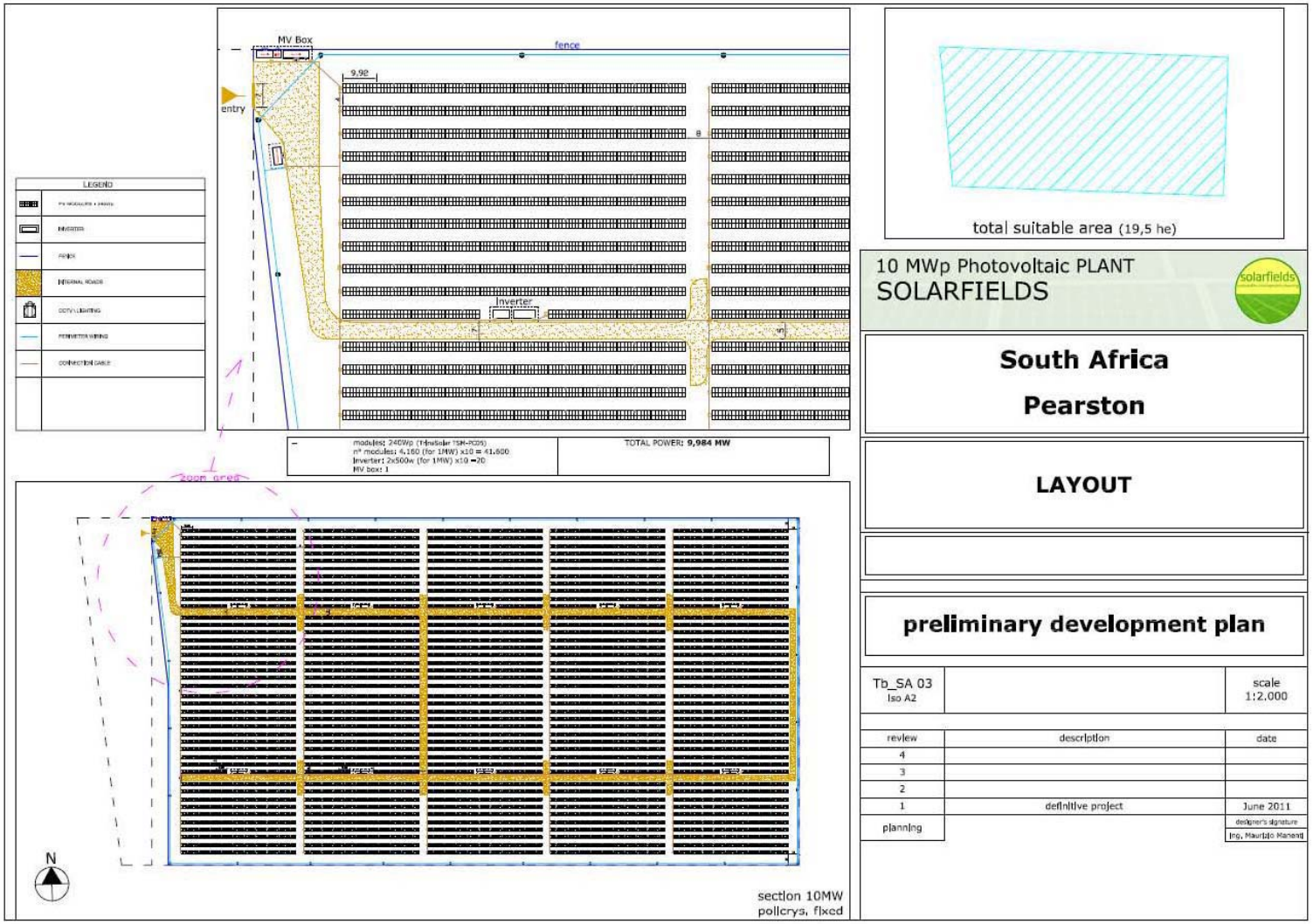
➢ **Figure 10: An aerial photograph showing the location of the property (indicated in red) with the area proposed for the solar farm (marked in blue).**

ii. The Concept

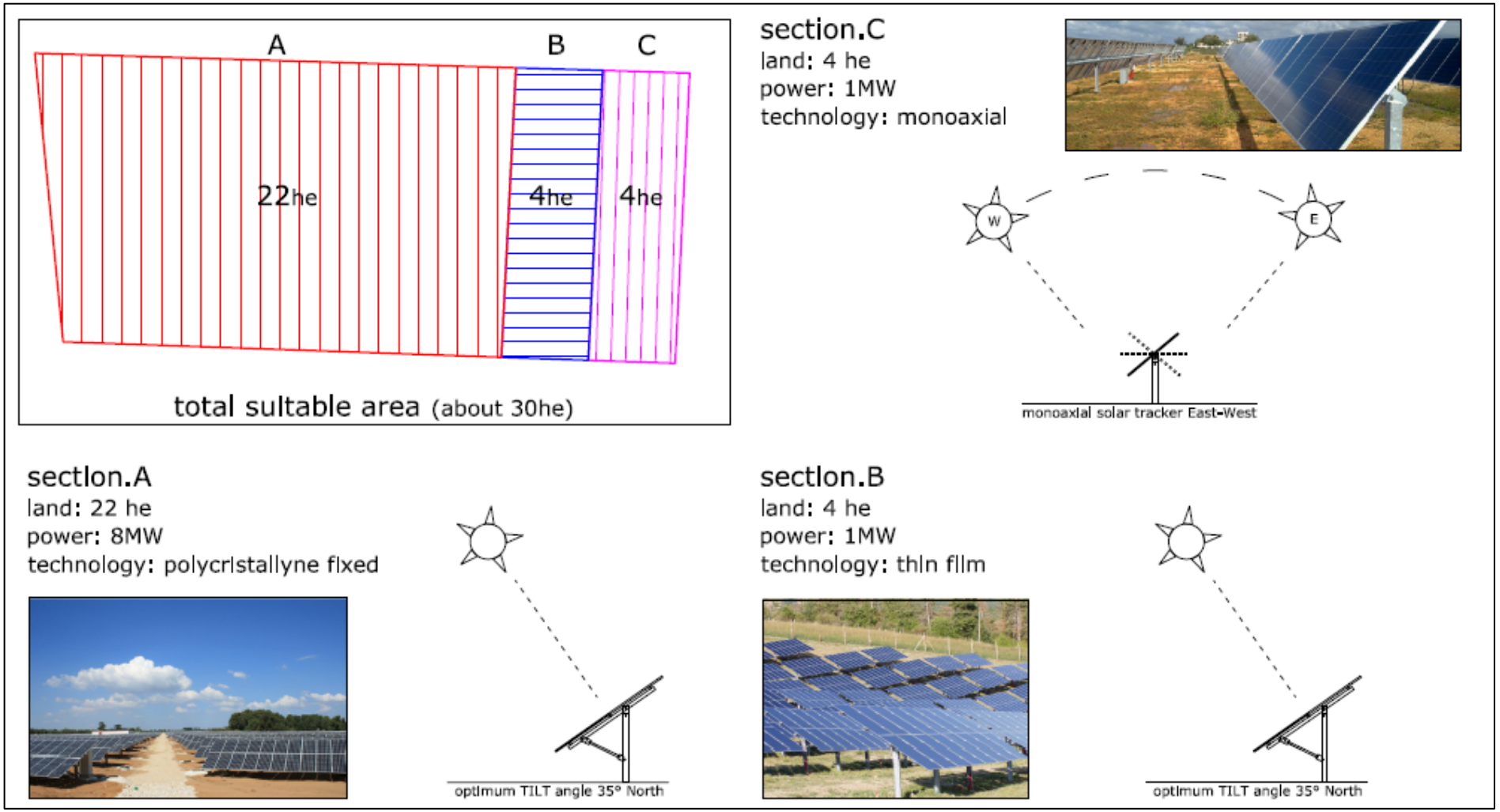
A preliminary development plan of the proposed solar farm development on the Farm Kraanvoëlkuil and Pearston Commonage, Pearston, Eastern Cape is shown in Figure 11. Further details of the different solar panels found in the different sections of the solar farm are shown in Figure 12.

The solar panel height is described as being 2.4 meters at its highest point.

Figure 13 and Figure 14 show the nature of the environment at the proposed site and the surrounding area.

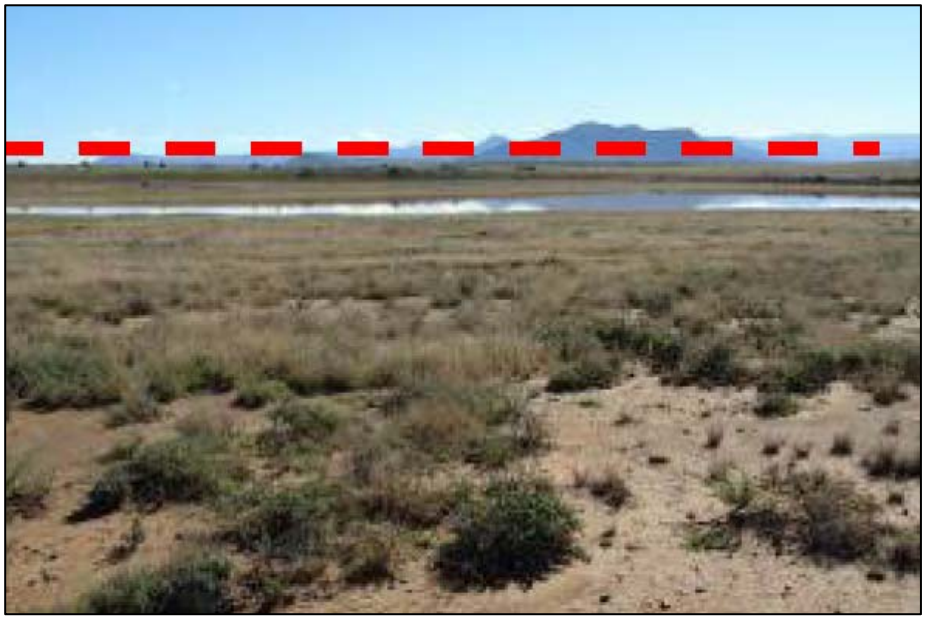


➢ **Figure 11: The preliminary development plan of the proposed solar farm development on the Farm Kraanvoelkuil and Pearston Commonage, Pearston, Eastern Cape.**



- **Figure 12: Details of the different specifications of the different solar panels that will be placed in each of the three sections A, B and C.**

- **Figure 13: The view north of the proposed development area showing the arid conditions.**



- **Figure 14: The view from the south of the proposed development site. The red hashed line is a rough indication of where the proposed development would be located.**

C. Assessment

i. Assessment Parameters

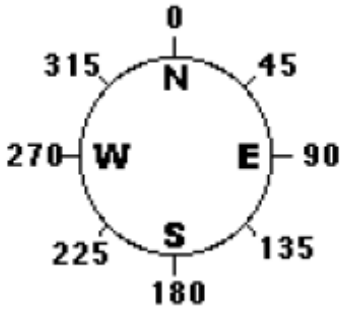
Observation points number: 13 points

Observation point height value (OFFSETA):

- 1.6 m (average height of an observer) at ground level,
- 1.2 m (road users)

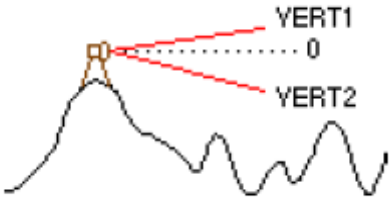
Horizontal angle start (AZIMUTH1): 0°

Horizontal angle end (AZIMUTH2): 360°



Vertical angle – top (VERT1): 90°

Vertical angle – bottom (VERT2): -90°



DEM input: 20 m contours.

ii. View Points

A viewpoint is defined as a selected point in the landscape from which views of a particular project or other feature(s) can be obtained.

Viewpoints considered in this viewshed assessment (Figure 15) included the following:

- Pearston
  - Southern areas (Viewpoint 1 and 4)
  - Northern areas (Viewpoint 2 and 3)

- Neighbouring Farms
  - Alleengelaten (Viewpoint 5)
  - Thorngrove (Viewpoint 6)
  - Turksvylaagte (Viewpoint 7)
  - Kransvoëlkuil (Viewpoint 8)
  - Wildebeeskuil (Viewpoint 9
  - Bogentwini (Viewpoint 10)
  - Jackson (Viewpoint 11)

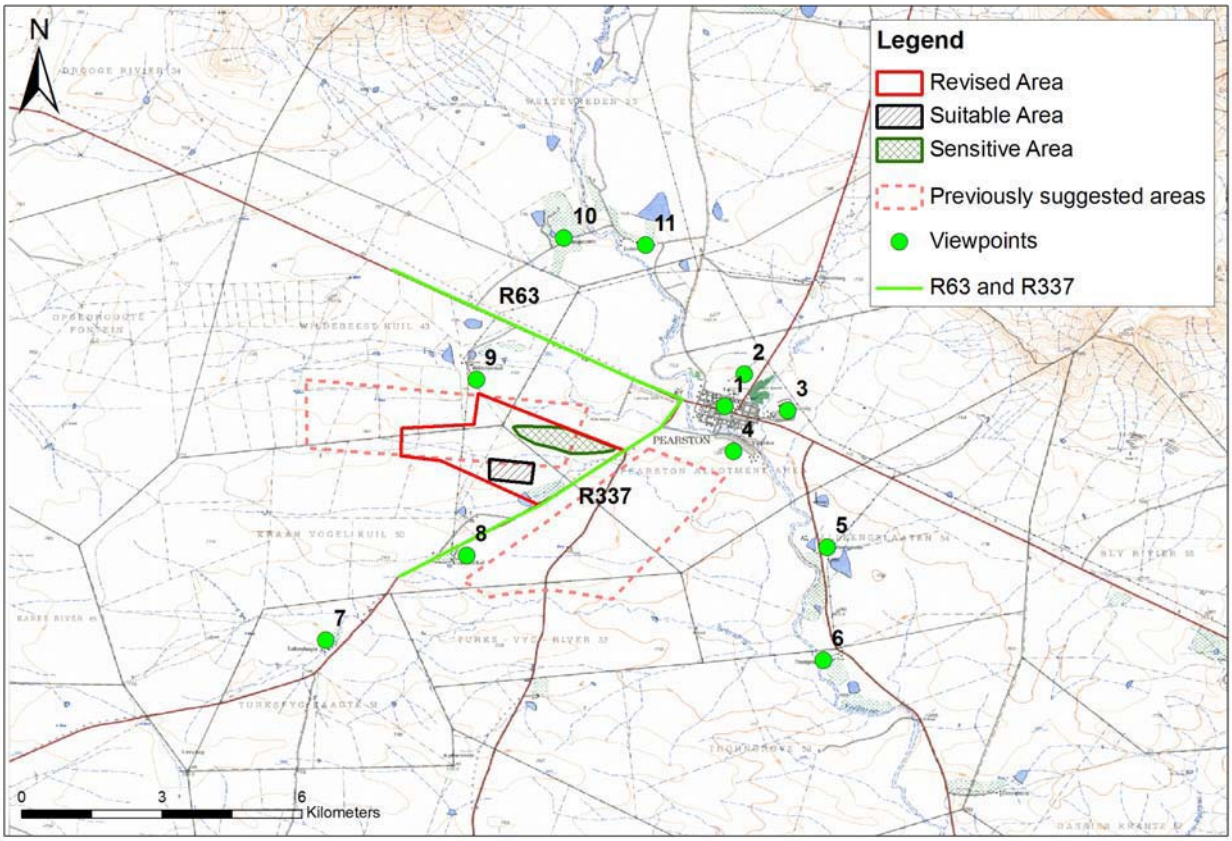
- Surrounding roads:
  - R337 (A 6.4km section starting from the R63 just west of the town of Pearston).
  - R63 (A 6 km long section of the R63 starting at the town of Pearston measured in a westerly direction).

iii. Visibility Analysis

The visibility of the proposed development on the Farm Kraanvoëlkuil and Pearston Commonage, Pearston, Eastern Cape was assessed from each of the viewpoints listed above. A viewshed map was produced for each viewpoint and is discussed in more detail below.

Three dimensional representations of the current view, the view with the proposed solar farm development with and without mitigation measures (2m high hedge) were generated. These representations where generated to scale and provide a simulation of the views that would be visible from the various

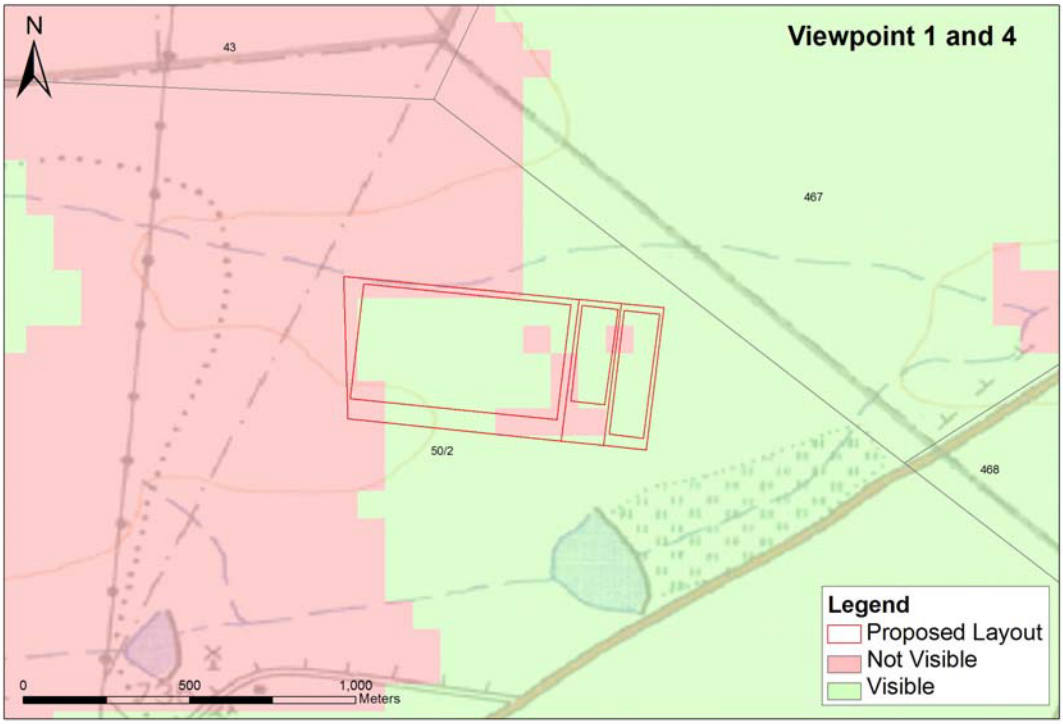
viewpoints. The existing surrounding buildings within the town of Pearston as well as on surrounding farms were also incorporated into the 3D models of the area.



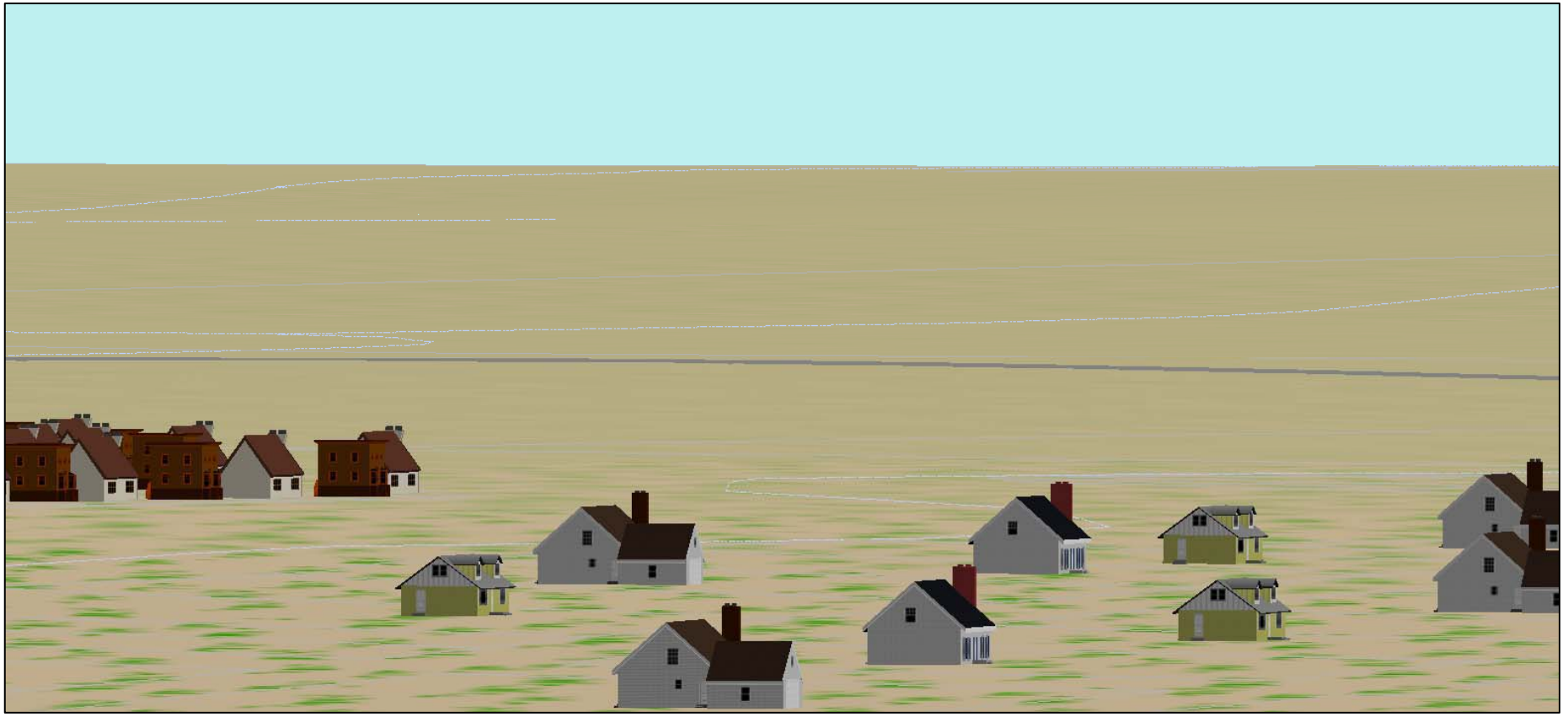
- **Figure 15: Map of the Pearston area indicating the various Viewpoints used in the viewshed analyses.**

Viewpoint 1 and 4 (Pearston – Southern Areas)

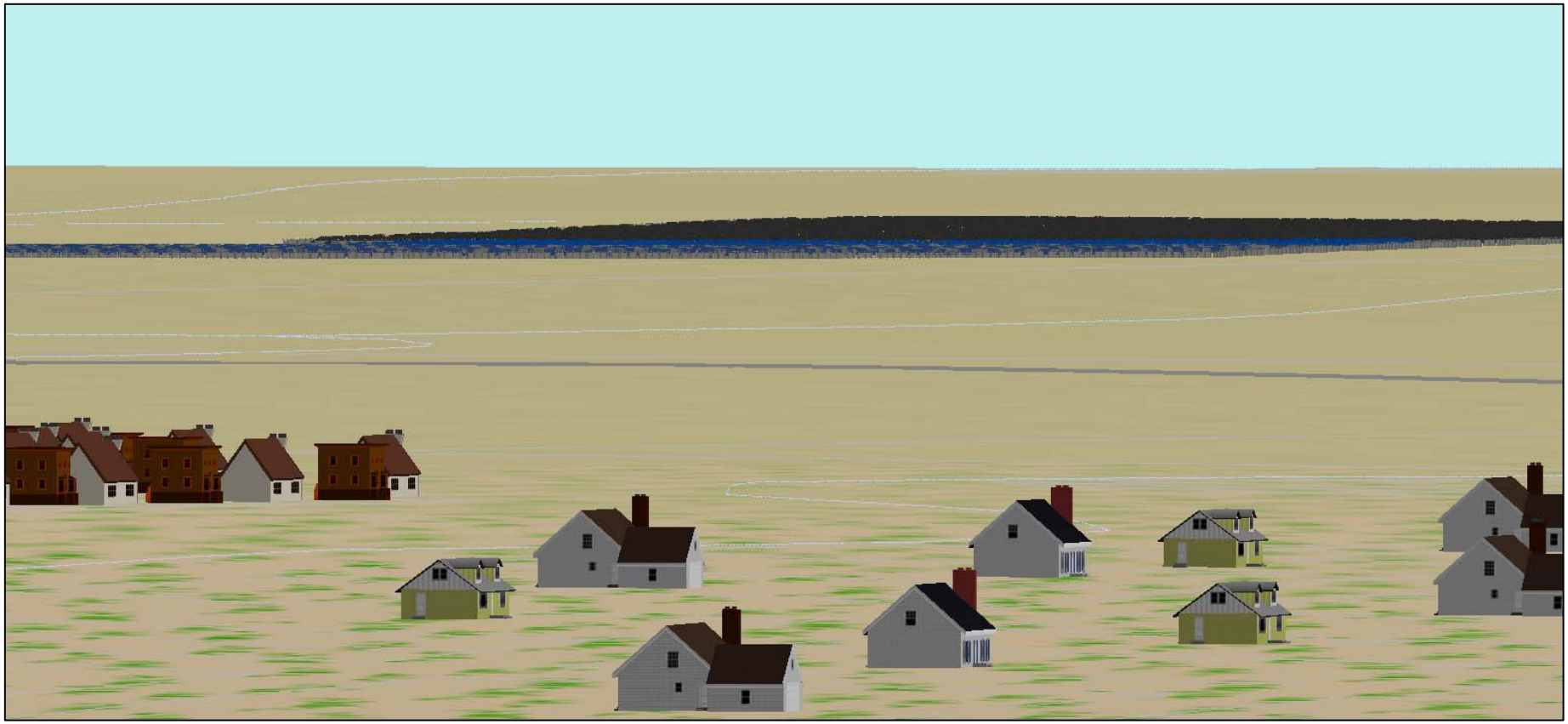
- The whole of the solar farm development will be visible from the viewpoints in the southern parts of the town of Pearston (Figure 16).
- The solar farm development takes up a considerable portion of the view when viewed from the southern section from Pearston (Figure 17).
- Mitigation measures (the 2 m high hedging) softens the fence line surrounding the boundary of the development, however the proposed development still remains prominent (Figure 18).
- It should be noted that the residents of Pearston are surrounded by buildings and developments associated with a rural town.



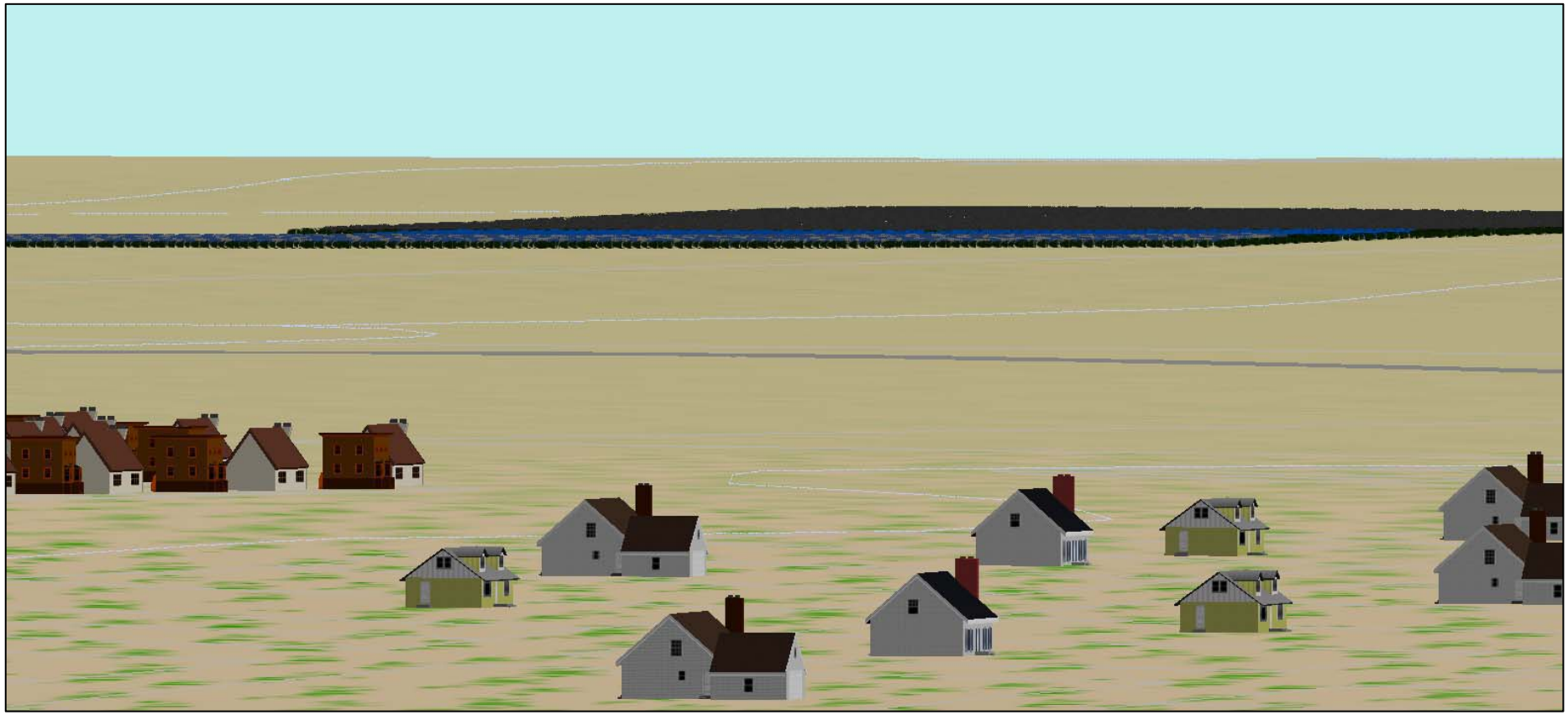
➢ **Figure 16: Viewshed of Viewpoint 1 and 4 (Pearston-Southern Areas).**



- **Figure 17: Viewpoint 1 and 4 (Pearston – Southern Areas) – existing view.**



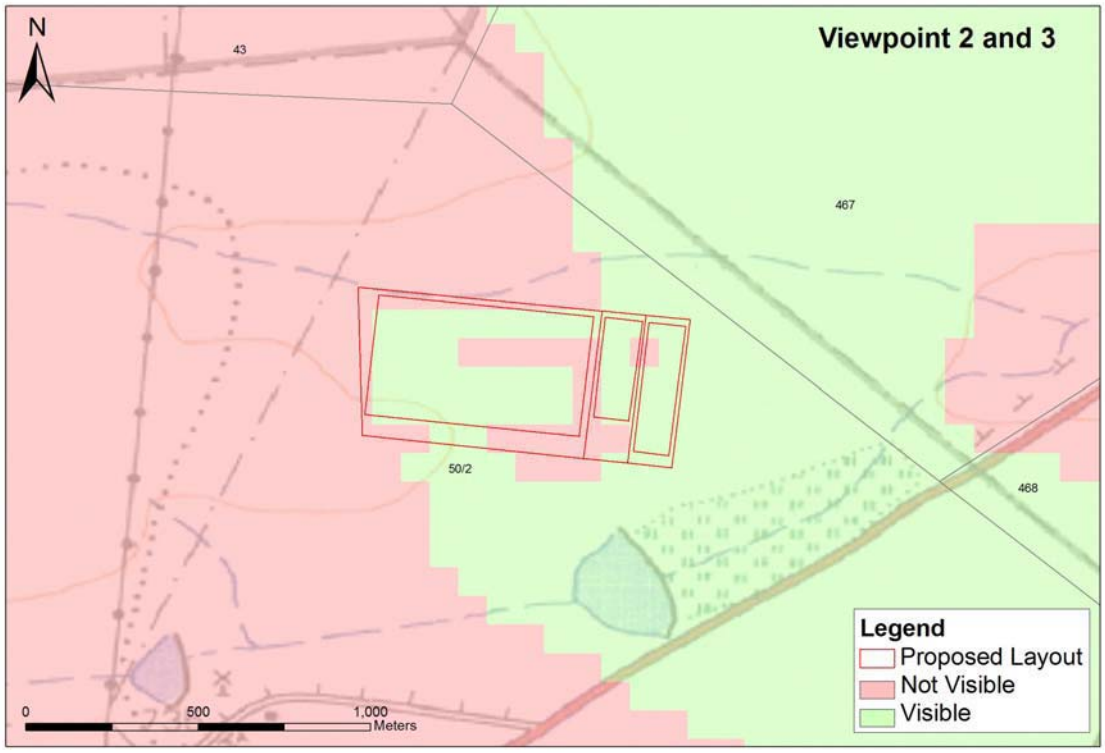
- **Figure 18: Viewpoint 1 and 4 (Pearston – Southern Areas) – view of proposed solar farm development without mitigation measures in place.**



- **Figure 19: Viewpoint 1 and 4 (Pearston – Southern Areas) – view of proposed solar farm development with mitigation measures in place.**

Viewpoint 2 and 3 (Pearston – Northern Areas)

- The whole of the solar farm development will be visible from the viewpoints in the northern parts of the town of Pearston (Figure 20).
- The solar farm development takes up a considerable portion of the view when viewed from the northern section from Pearston (Figure 22).
- Mitigation measures (the 2 m high hedging) softens the fence line surrounding the boundary of the development, however the proposed development still remains prominent (Figure 23).
- It should be noted that the residents of Pearston are surrounded by buildings and developments associated with a rural town.



- **Figure 20: Viewshed of Viewpoint 2 and 3 (Pearston – Northern Areas).**

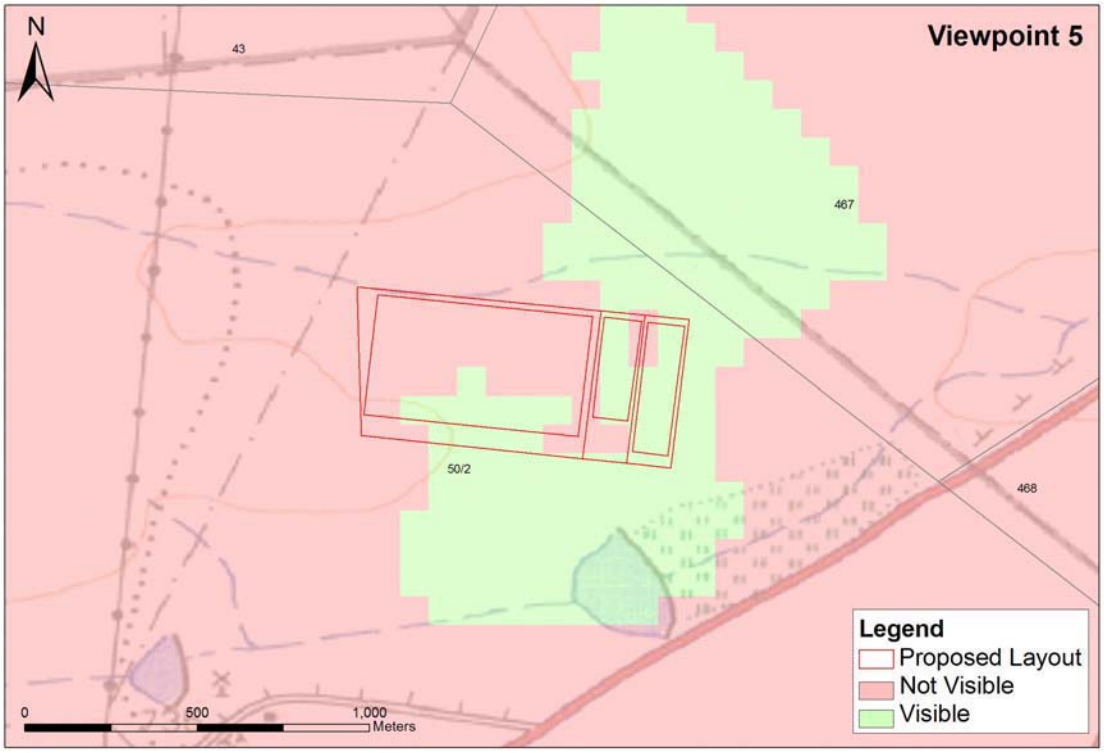
- **Figure 21: Viewpoint 2 and 3 (Pearston – Northern Areas) – existing view.**

- **Figure 22: Viewpoint 2 and 3 (Pearston – Northern Areas) – view of proposed solar farm development without mitigation measures in place.**

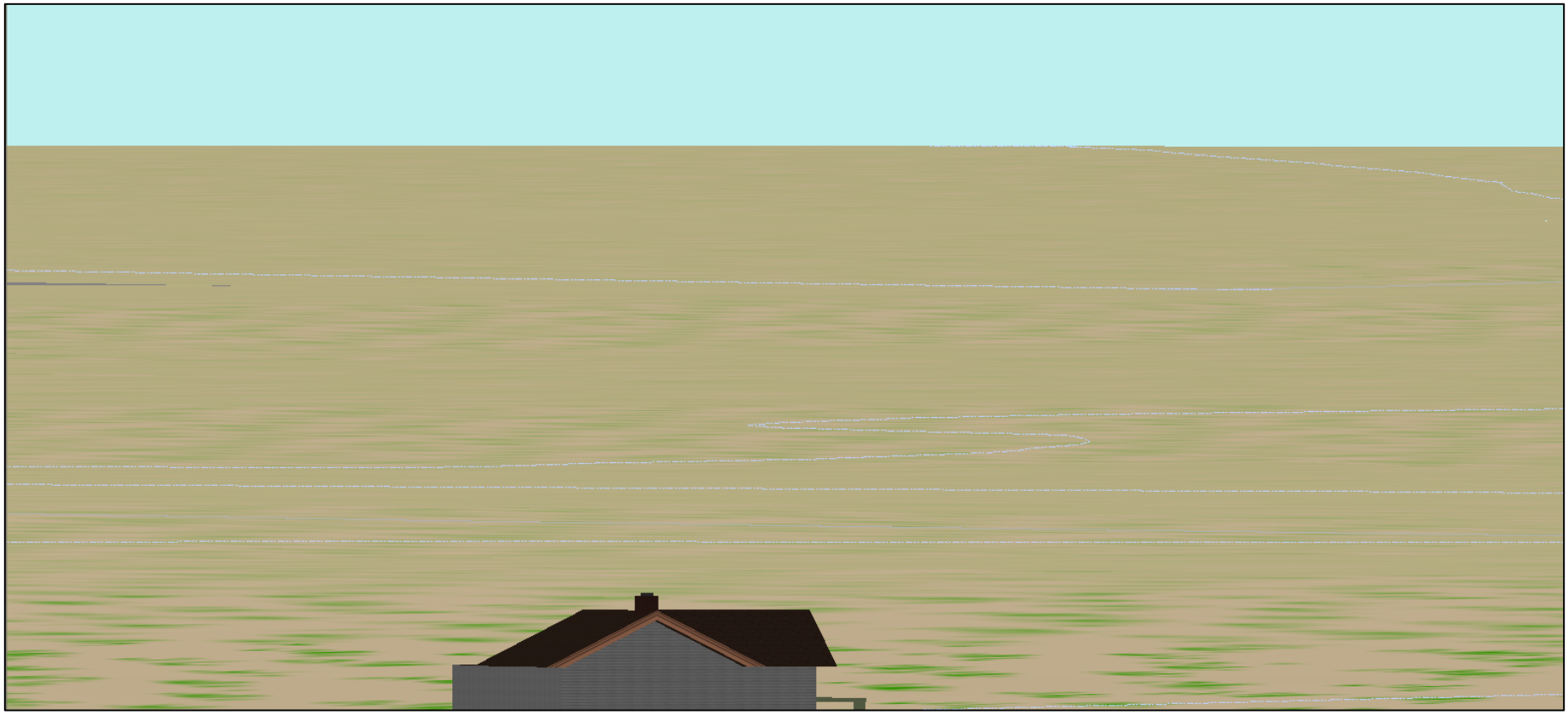
- **Figure 23: Viewpoint 2 and 3 (Pearston – Northern Areas) – view of proposed solar farm development with mitigation measures in place.**

Viewpoint 5 - Alleengelaten

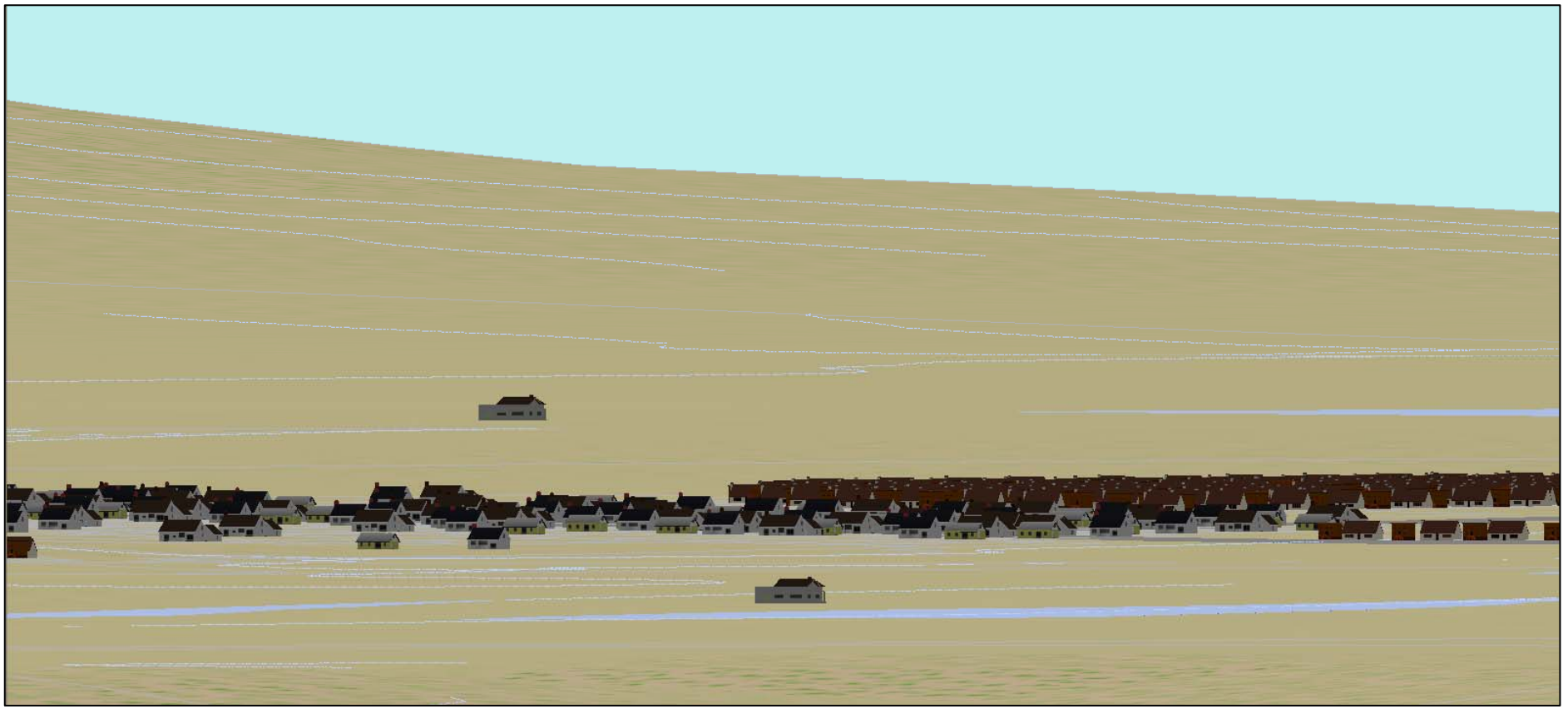
- Part of Section A, the whole of Section B and C are visible from Viewpoint 5 (Figure 24).
- The solar farm development takes up a considerable portion of the view when viewed from Viewpoint 5 (Figure 27).
- Mitigation measures (the 2 m high hedging) softens the fence line surrounding the boundary of the development, however the proposed development still remains prominent (Figure 28).
- It should be noted that the residents at the Farm Alleengelaten at Viewpoint 5 also have an extensive view of the town of Pearston (Figure 26).



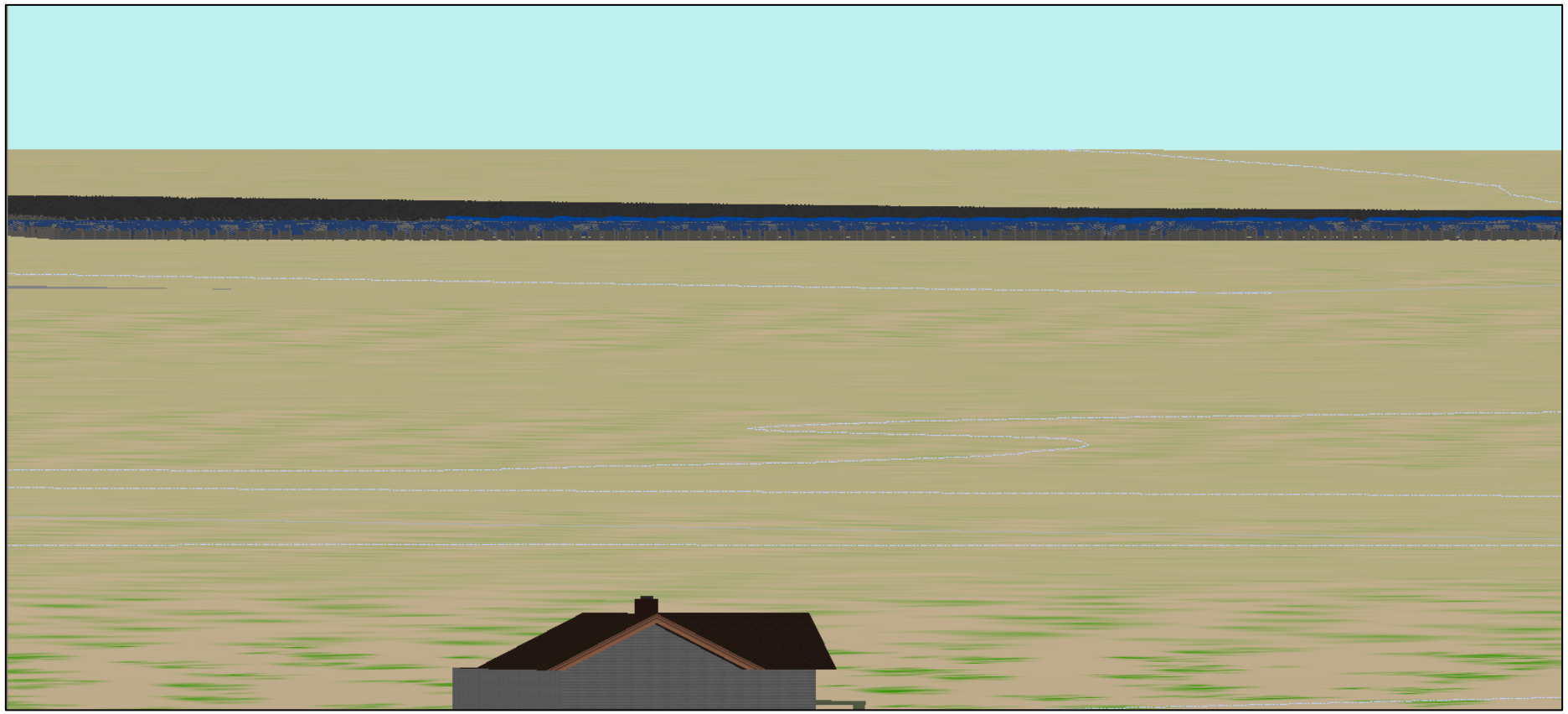
- **Figure 24: Viewshed of Viewpoint 5 (Alleengelaten).**



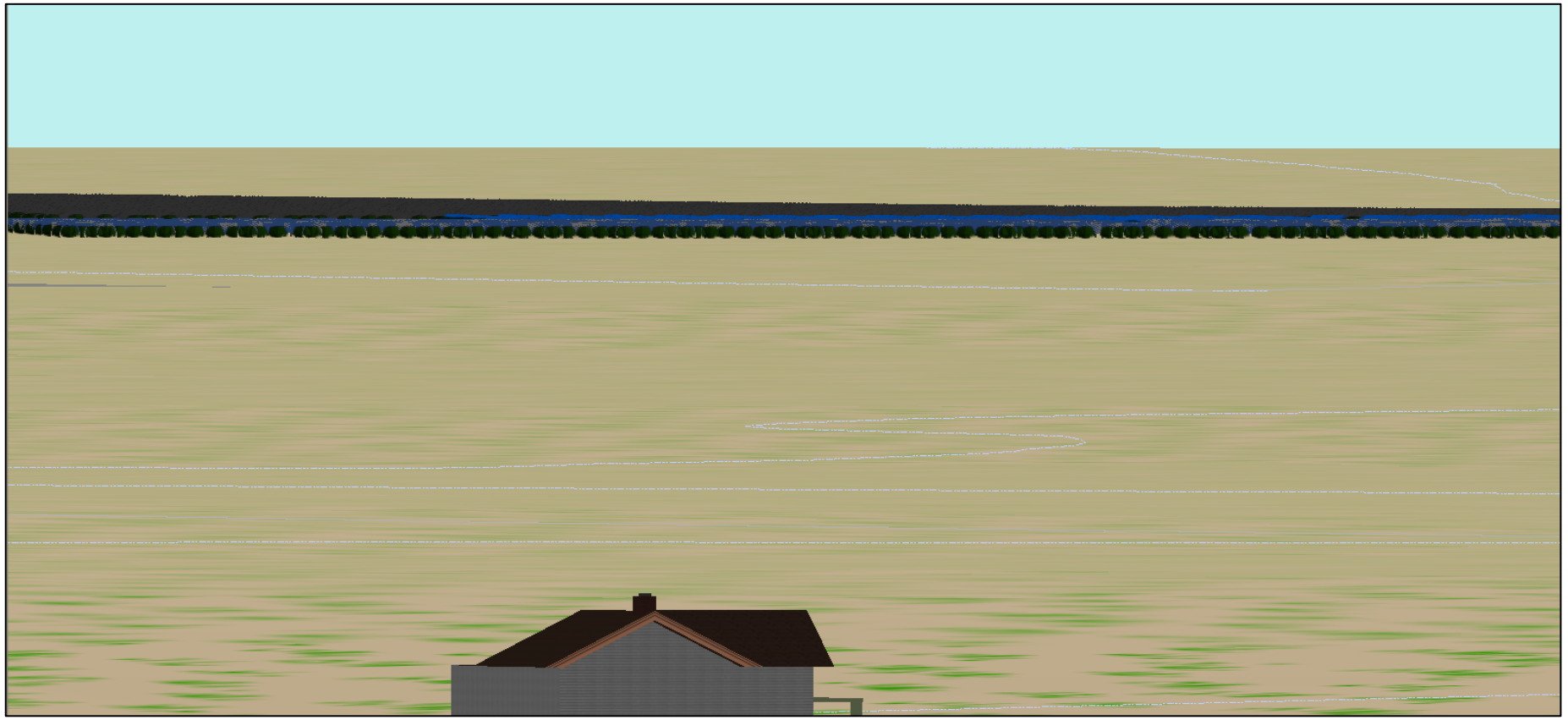
- **Figure 25: Viewpoint 5 (Alleengelaten) – existing view in the direction of the proposed development area.**



- **Figure 26: Viewpoint 5 (Alleengelaten) – existing view in the direction of the town of Pearston.**



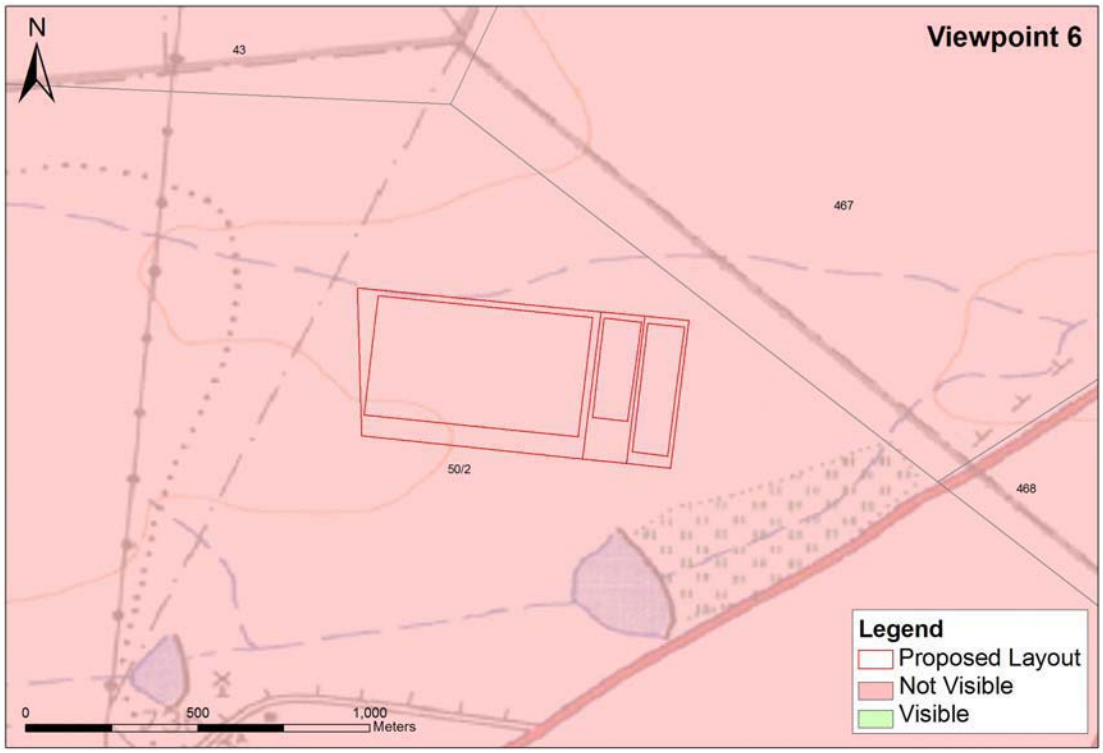
- **Figure 27: Viewpoint (Alleengelaten) – view of proposed solar farm development without mitigation measures in place.**



➢ **Figure 28: Viewpoint 5 (Alleengelaten) – view of proposed solar farm development with mitigation measures in place.**

Viewpoint 6 - Thorngrove

- No part of the proposed solar farm development will be visible from Viewpoint 6, the Farm Thorngrove (Figure 29).
- The existing view from this viewpoint will remain unchanged (Figure 30).

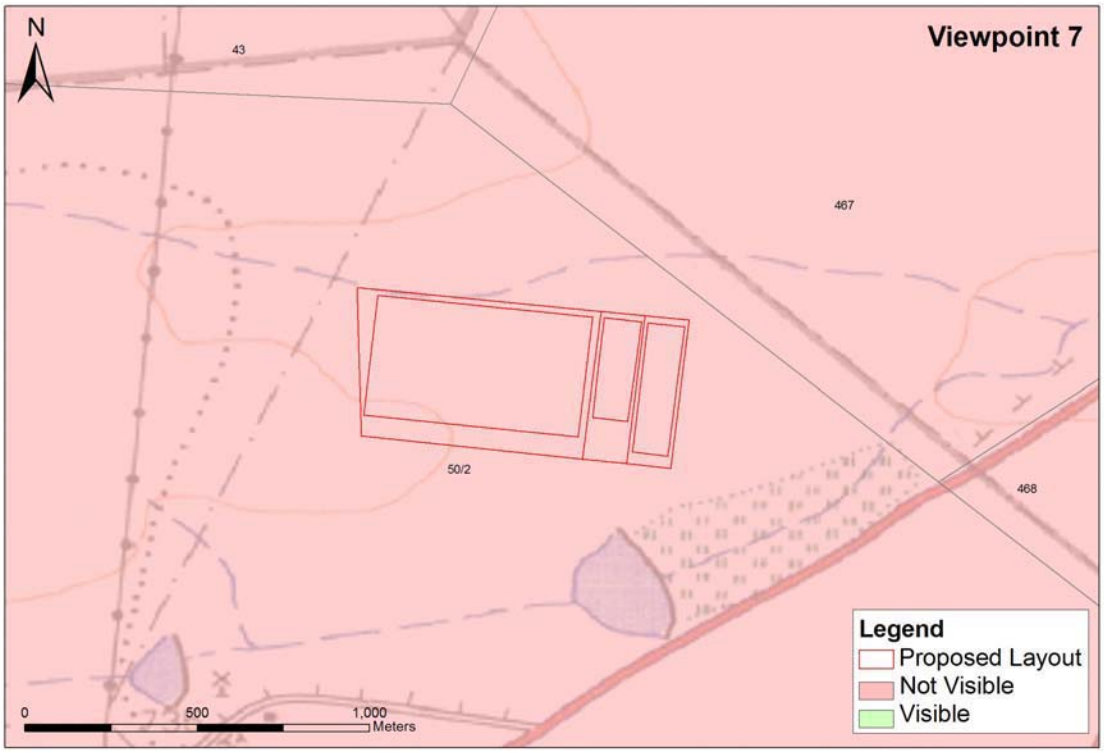


- **Figure 29: Viewshed of Viewpoint 6 (Thorngrove).**

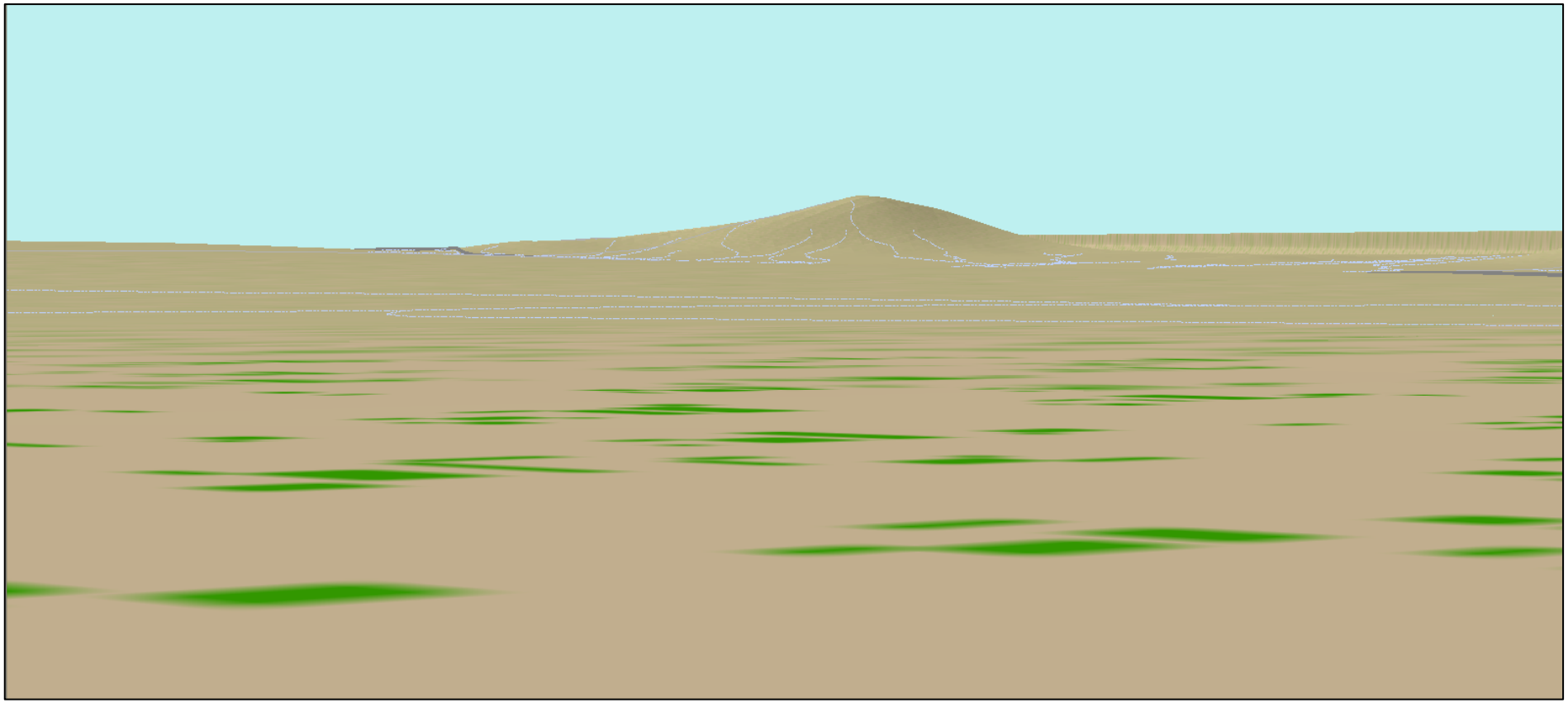
- **Figure 30: Viewpoint 6 (Thorngrove) – existing view.**

Viewpoint 7 – Turksvylaagte

- No part of the proposed solar farm development will be visible from Viewpoint 7, the Farm Turksvylaagte (Figure 31).
- The existing view from this viewpoint will remain unchanged (Figure 32).



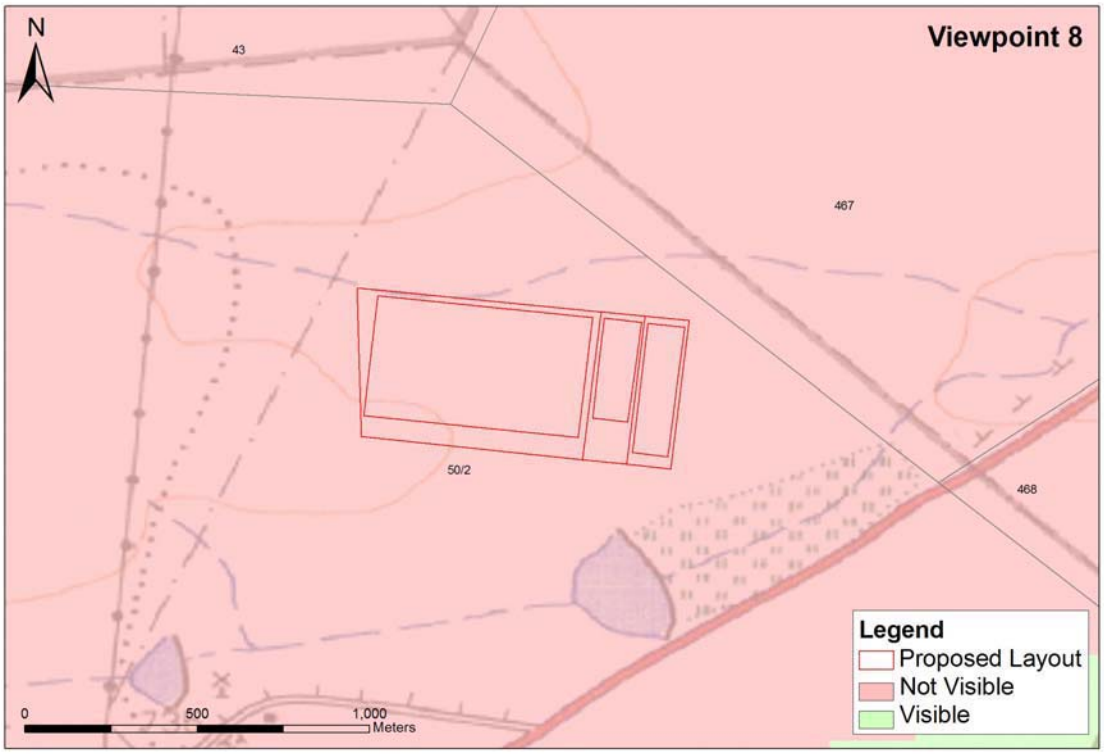
- **Figure 31: Viewshed of Viewpoint 7 (Turksvylaagte).**



- **Figure 32: Viewpoint 7 (Turksvylaagte) – existing view.**

Viewpoint 8 - Kransvoelkuil

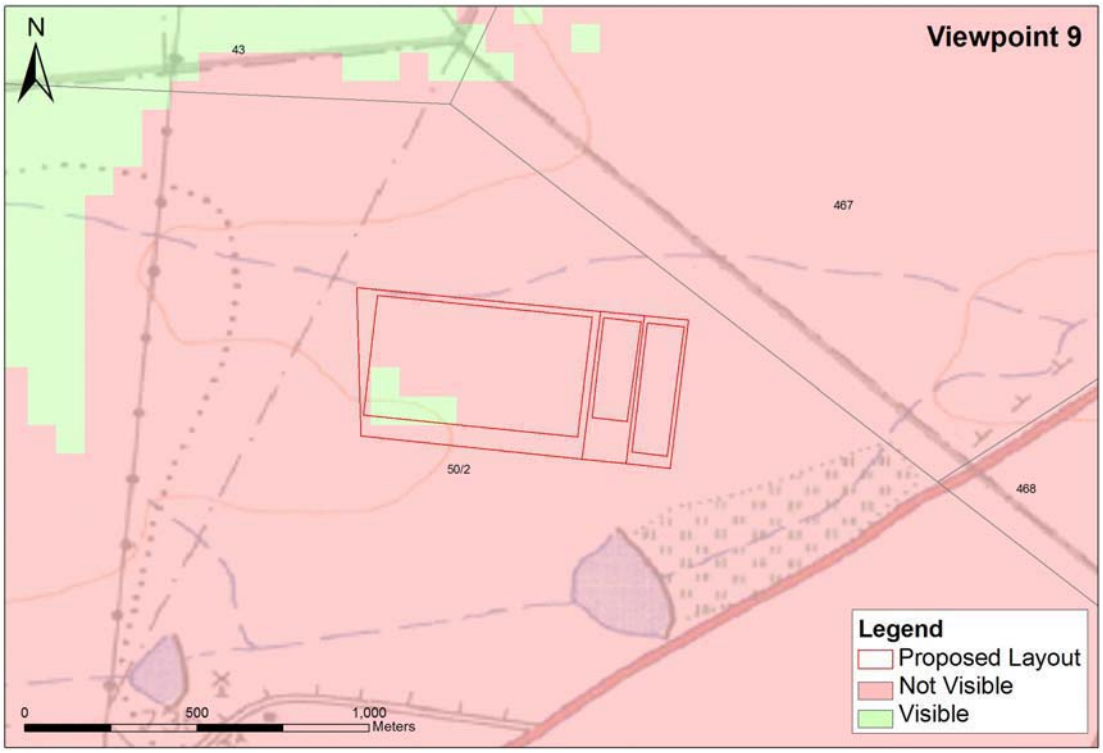
- No part of the proposed solar farm development will be visible from Viewpoint 7, the Farm Turksvylaagte (see Figure 33).
- The existing view from this viewpoint will remain unchanged.



- **Figure 33: Viewshed of Viewpoint 8 (Kransvoëlkuil).**

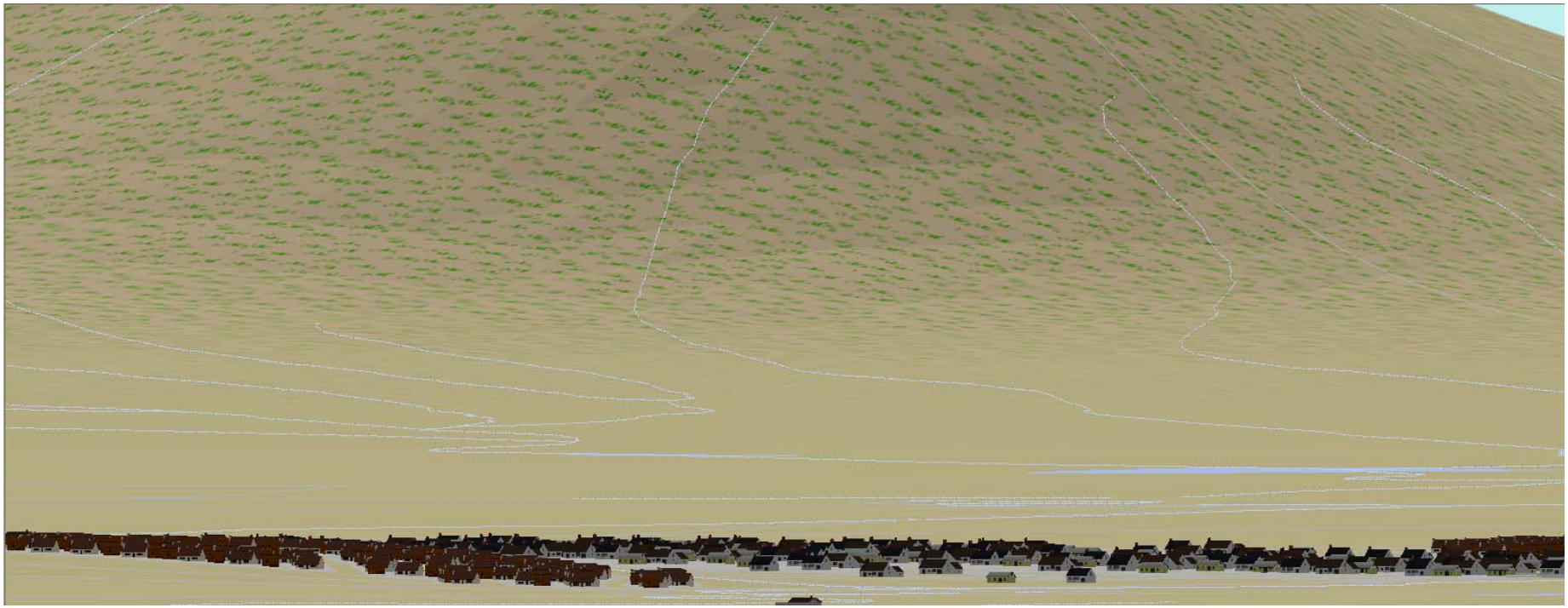
Viewpoint 9 - Wildebeeskuil

- Only a small portion of Section A is visible from Viewpoint 9, the Farm Wildebeeskuil (Figure 34).
- The solar farm development takes up a considerable portion of the view when viewed from Viewpoint 9 (Figure 37).
- Mitigation measures (the 2 m high hedging) softens the fence line surrounding the boundary of the development, however the proposed development still remains prominent (Figure 38).
- It should be noted that the residents at the Farm Wildebeeskuil at Viewpoint 9 also have an extensive view of the town of Pearston (Figure 36).



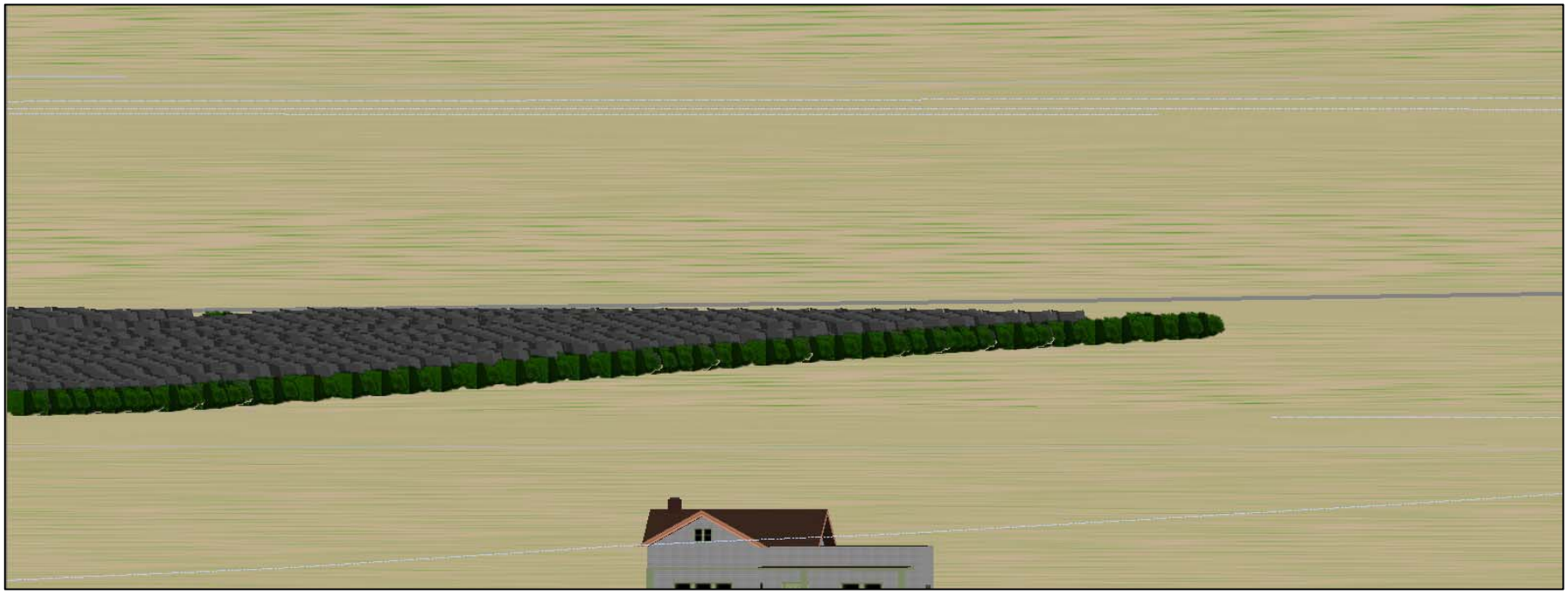
- **Figure 34: Viewshed of Viewpoint 9 (Wildebeeskuil).**

- **Figure 35: Viewpoint 9 (Wildebeeskuil) – existing view in the direction of the proposed development area.**



- **Figure 36: Viewpoint 9 (Wildebeeskuil) – existing view in the direction of the town of Pearston.**

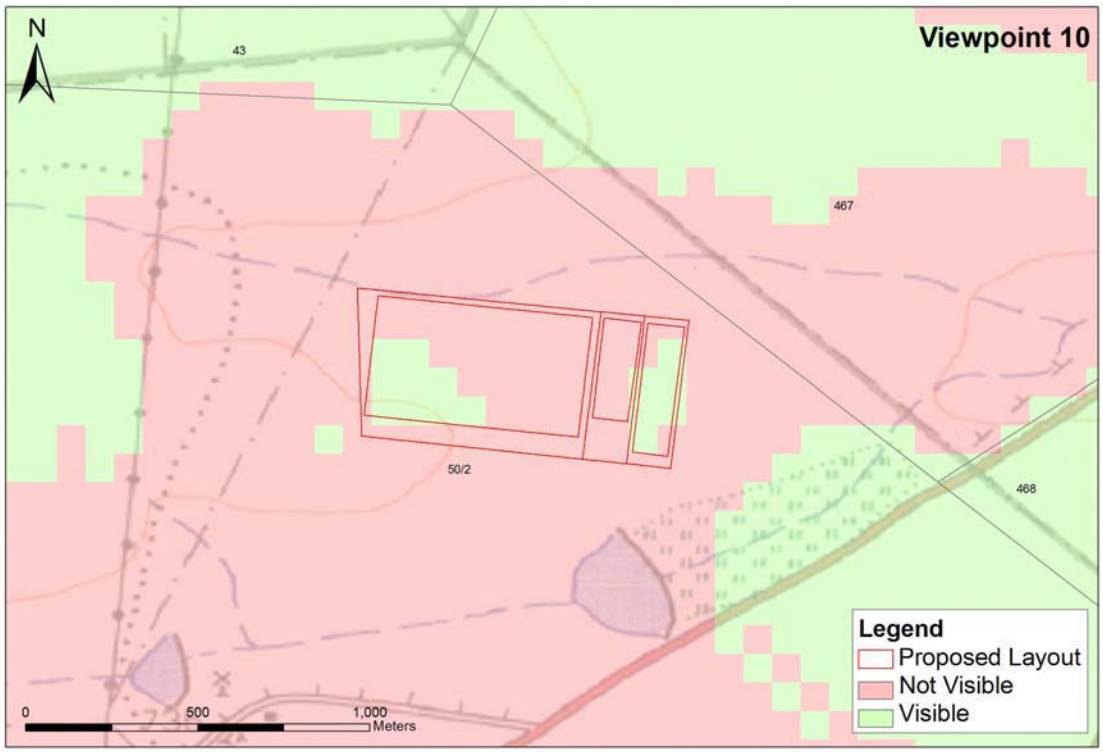
- **Figure 37: Viewpoint 9 (Wildebeeskuil) – view of proposed solar farm development without mitigation measures in place.**



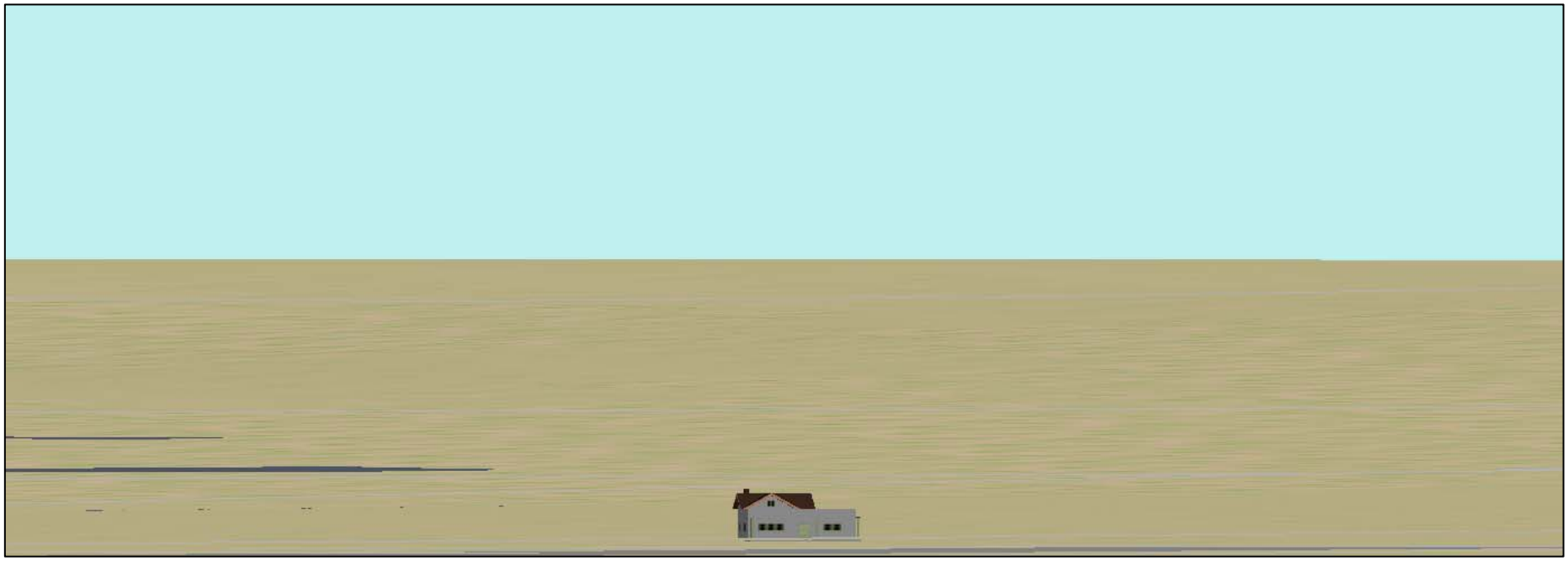
- **Figure 38: Viewpoint 9 (Wildebeeskuil) – view of proposed solar farm development with mitigation measures in place.**

Viewpoint 10 – Bogentwini

- Approximately a third of Section A and most of Section C would be visible from Viewpoint 10, the Farm Bogentwini (Figure 39).
- The solar farm development is visible, but less prominent when viewed from Viewpoint 10 (Figure 42).
- Mitigation measures (the 2 m high hedging) softens the fence line surrounding the boundary of the development (Figure 43).
- It should be noted that the residents at the Farm Bogentwini at Viewpoint 10 also have an extensive view of the town of Pearston (Figure 41).

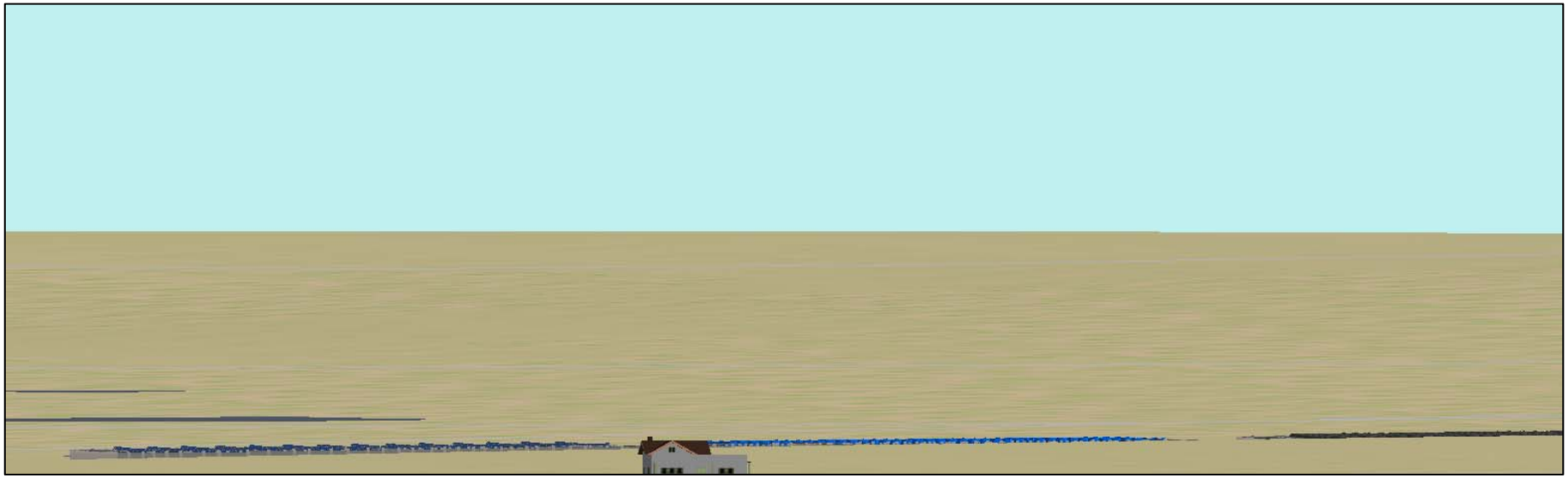


- **Figure 39: Viewshed of Viewpoint 10 (Bogentwini).**

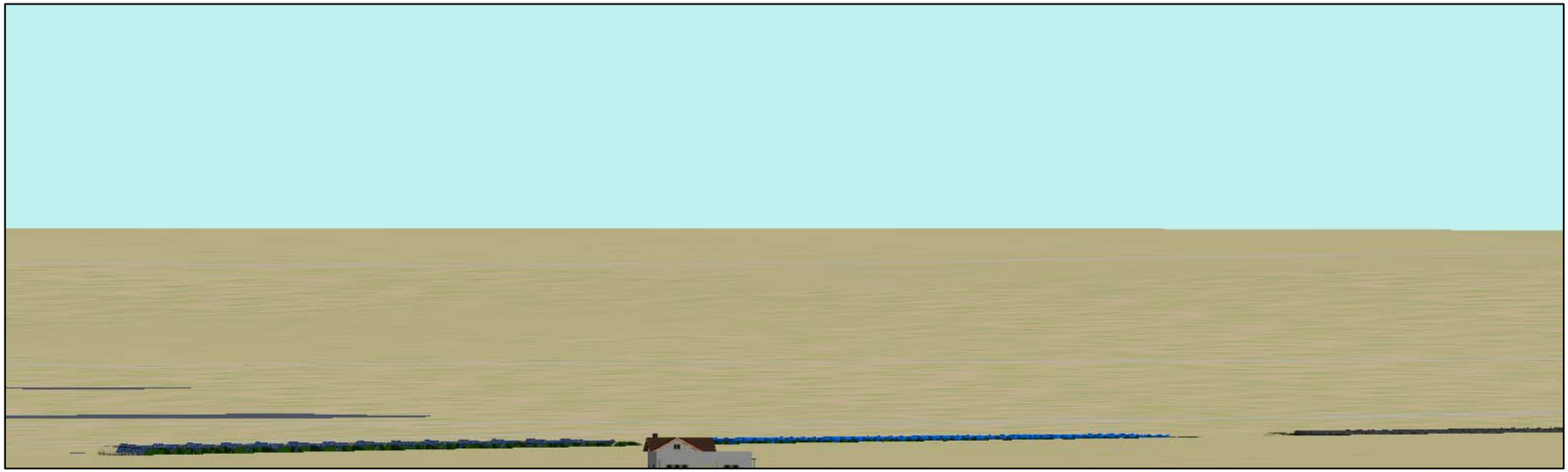


- **Figure 40: Viewpoint 10 (Bogentwini) – existing view in the direction of the proposed development area.**

- **Figure 41: Viewpoint 10 (Bogentwini) – existing view in the direction of the town of Pearston.**



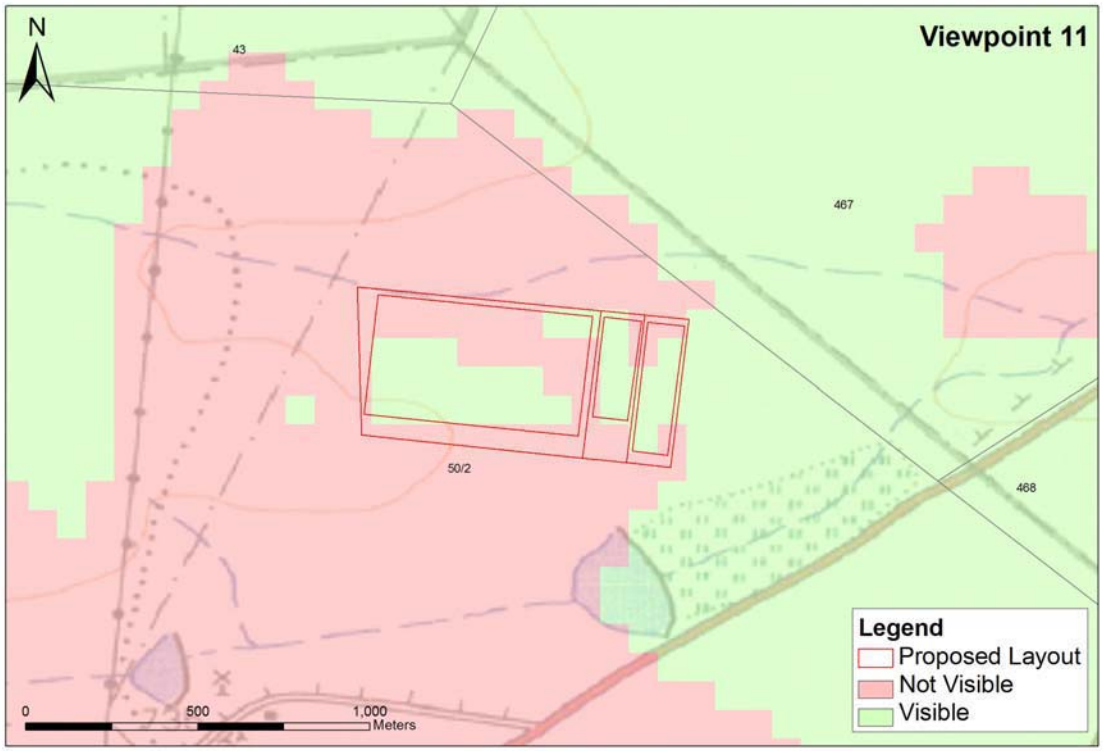
- **Figure 42: Viewpoint 10 (Bogentwini) – view of proposed solar farm development without mitigation measures in place.**



- **Figure 43: Viewpoint 10 (Bogentwini) – view of proposed solar farm development with mitigation measures in place.**

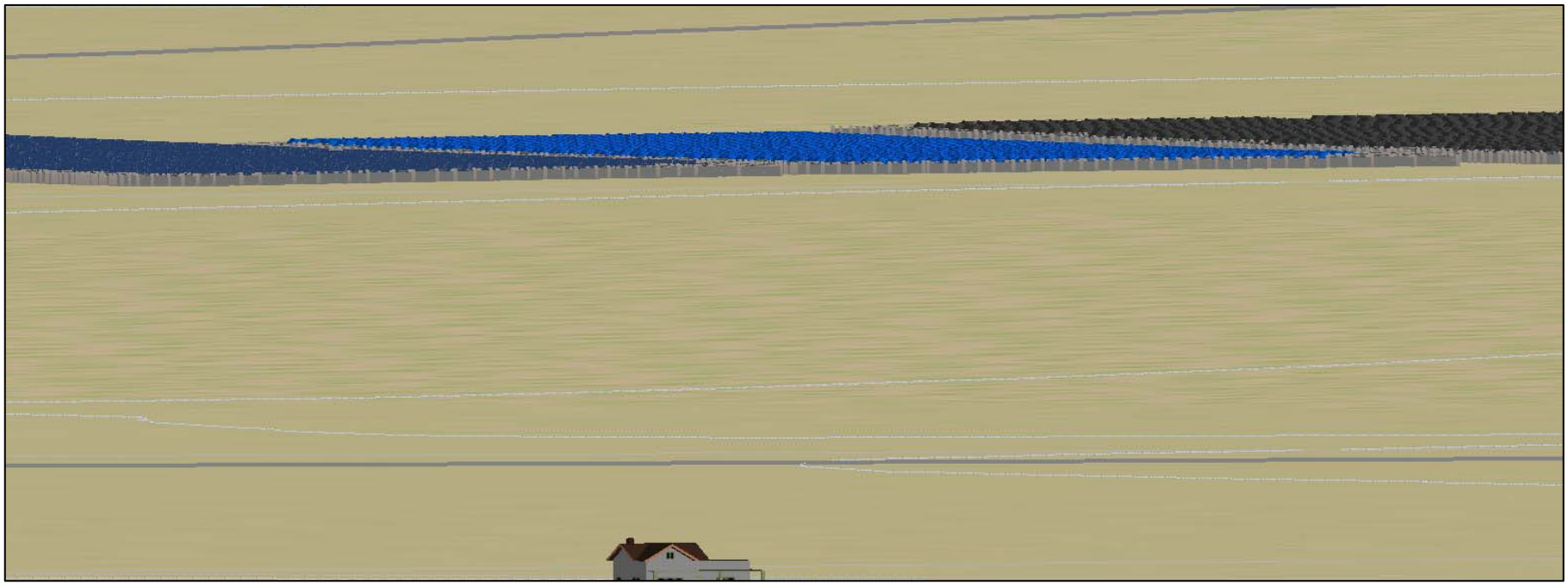
Viewpoint 11 - Jackson

- Approximately half of Section A, most of Section B and C would be visible from Viewpoint 11, the Farm Jackson (Figure 44).
- The solar farm development takes up a considerable portion of the view when viewed from Viewpoint 11 (Figure 46).
- Mitigation measures (the 2 m high hedging) softens the fence line surrounding the boundary of the development, however the proposed development still remains prominent (Figure 47).
- It should be noted that the residents at the Farm Jackson at Viewpoint 11 cannot see the town of Pearston and as such the solar farm development will have a greater visual impact at this viewpoint.

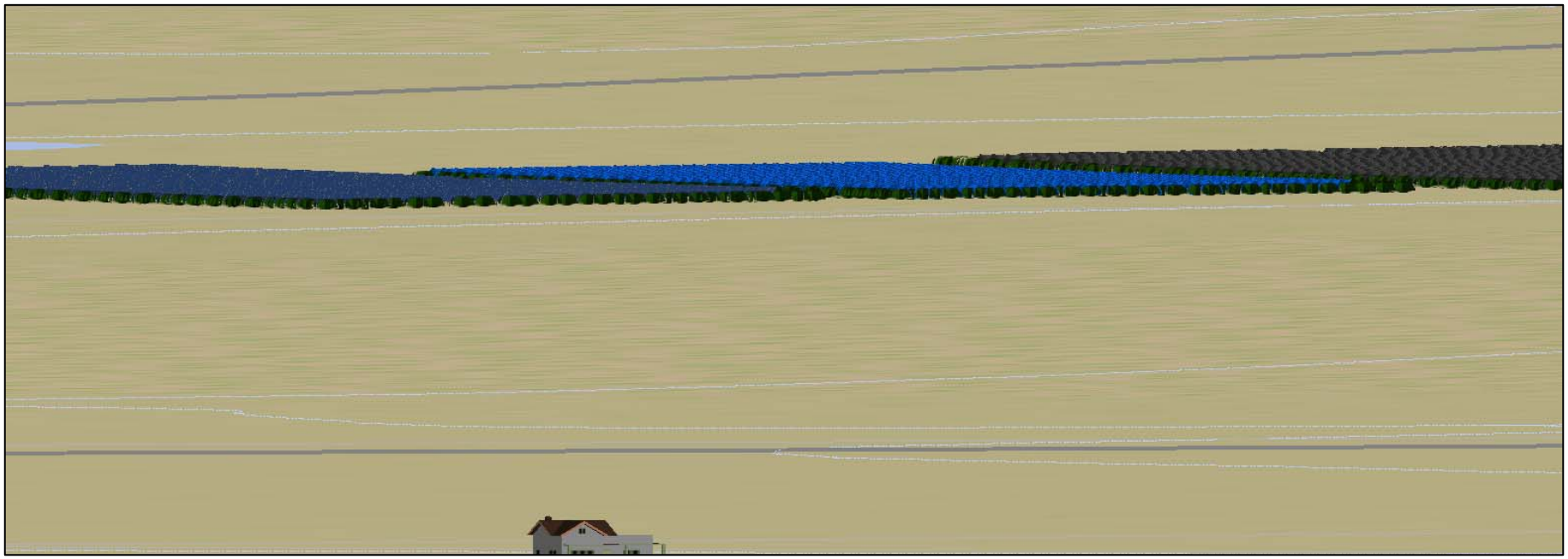


- **Figure 44: Viewshed of Viewpoint 11 (Jackson).**

- **Figure 45: Viewpoint 11 (Jackson) – existing view.**



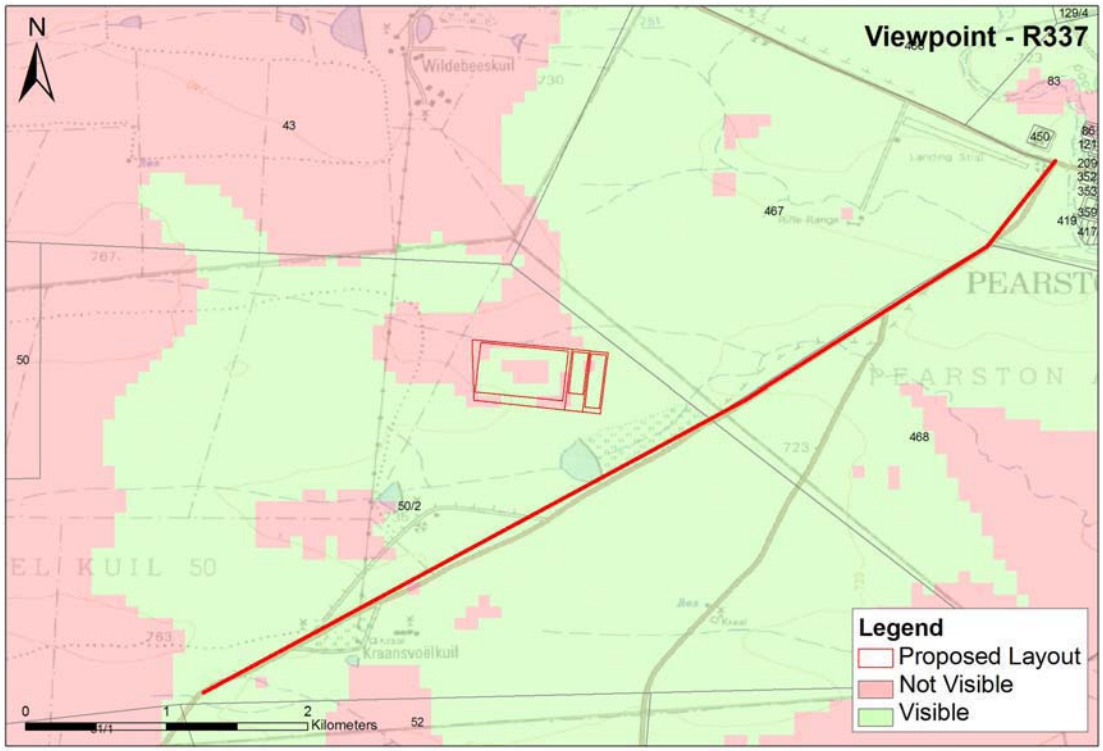
- **Figure 46: Viewpoint 11 (Jackson) – view of proposed solar farm development without mitigation measures in place.**



- **Figure 47: Viewpoint 11 (Jackson) – view of proposed solar farm development with mitigation measures in place.**

R337

- The majority of the solar farm development will be visible along the 6.4 km stretch of the R337 (as measured from the town of Pearston) (Figure 48).
- The solar farm development takes up a considerable portion of the view when viewed from the 6.4 km section of the R337 considered (Figure 51).
- Mitigation measures (the 2 m high hedging) softens the fence line surrounding the boundary of the development, however the proposed development still remains prominent (Figure 52).
- It should be noted that the majority of the town of Pearston is visible from this stretch of the R337 (Figure 50).



- **Figure 48: Viewshed R337 (6.4 kms of the the section of the R337 that starts from the R63 just west of the town of Pearston) (Note that the R337 is indicated by a red line).**

- **Figure 49: Viewpoint R337 – existing view in the direction of the proposed development area. (Note the R337 is indicated by the red line in the foreground).**

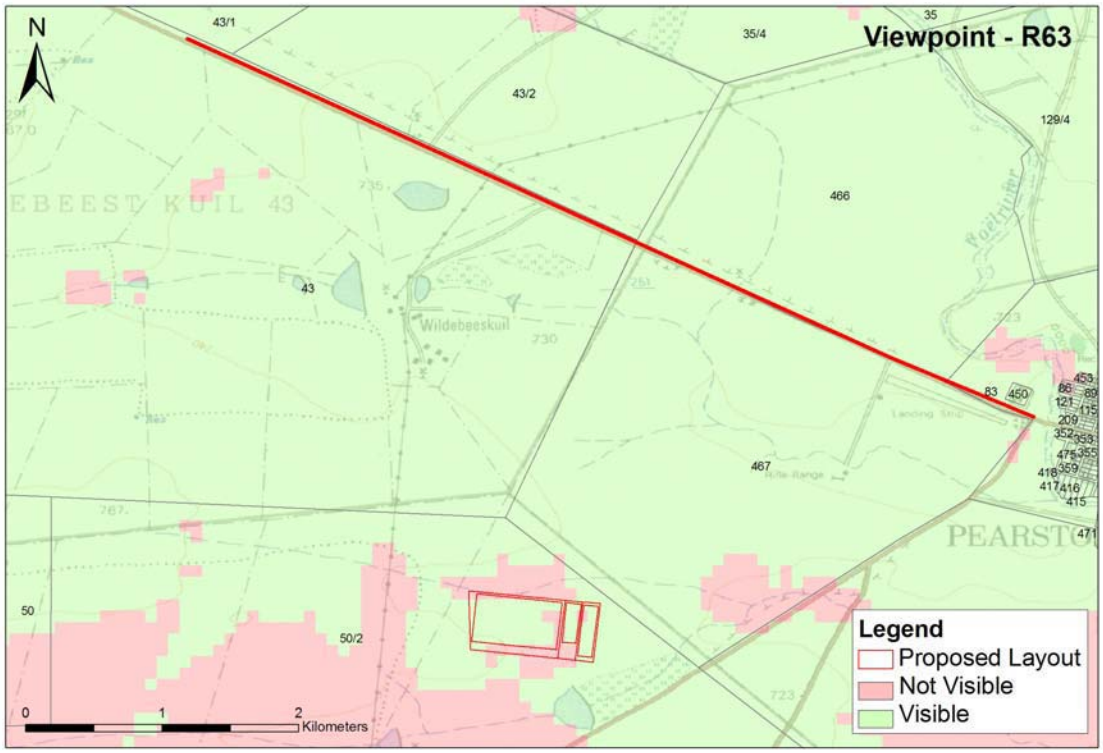
- **Figure 50: Viewpoint R337 – existing view in the direction of the town of Pearston. (Note the R337 are depicted as the grey lines in the foreground).**

- **Figure 51: Viewpoint R 337 – view of proposed solar farm development without mitigation measures in place. (Note the R337 is indicated by the red line in the foreground).**

- **Figure 52: Viewpoint R337 – view of proposed solar farm development with mitigation measures in place. (Note the R337 is indicated by the red line in the foreground).**

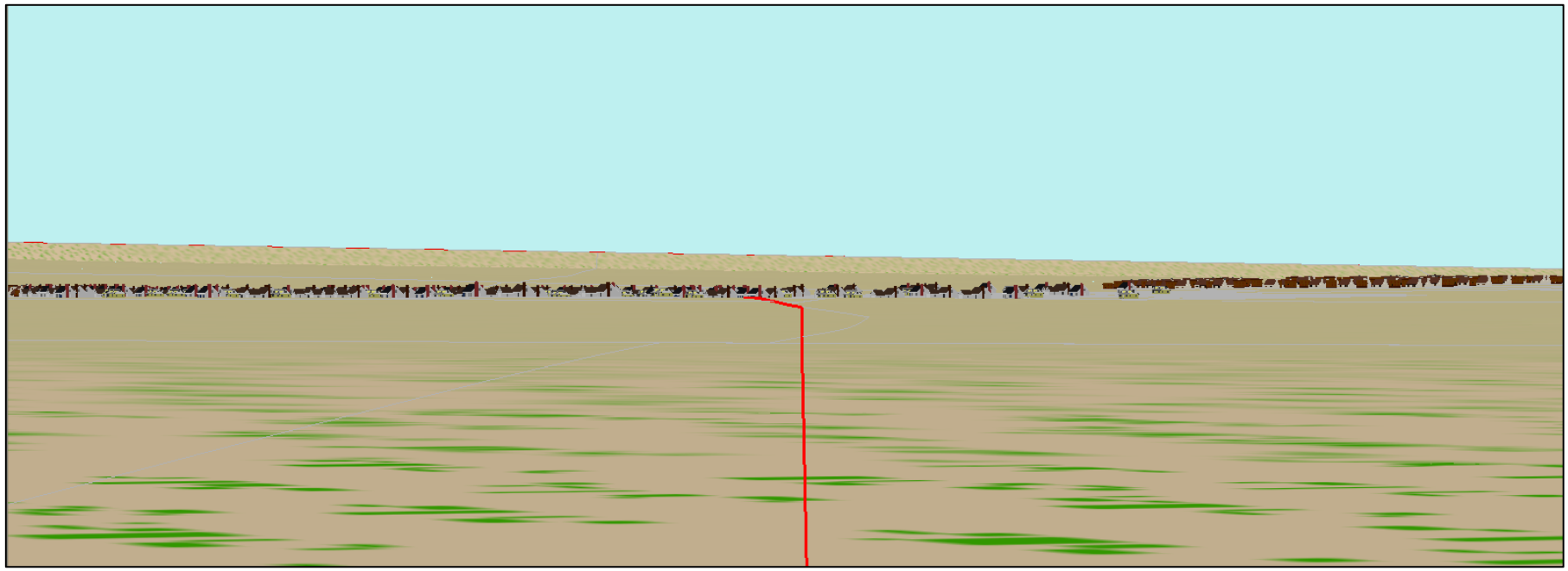
R63

- The majority of the solar farm development will be visible along the 6 km stretch of the R63 (as measured from the town of Pearston in a westerly direction) (Figure 53).
- The solar farm development takes up a significant portion of the view when viewed from the 6 km section of the R63 considered (Figure 56).
- Mitigation measures (the 2 m high hedging) softens the fence line surrounding the boundary of the development, however the proposed development will still be visible, however less prominent than if no mitigation measures were in place (Figure 57).
- It should be noted that the majority of the town of Pearston is visible from this stretch of the R63 (Figure 55).



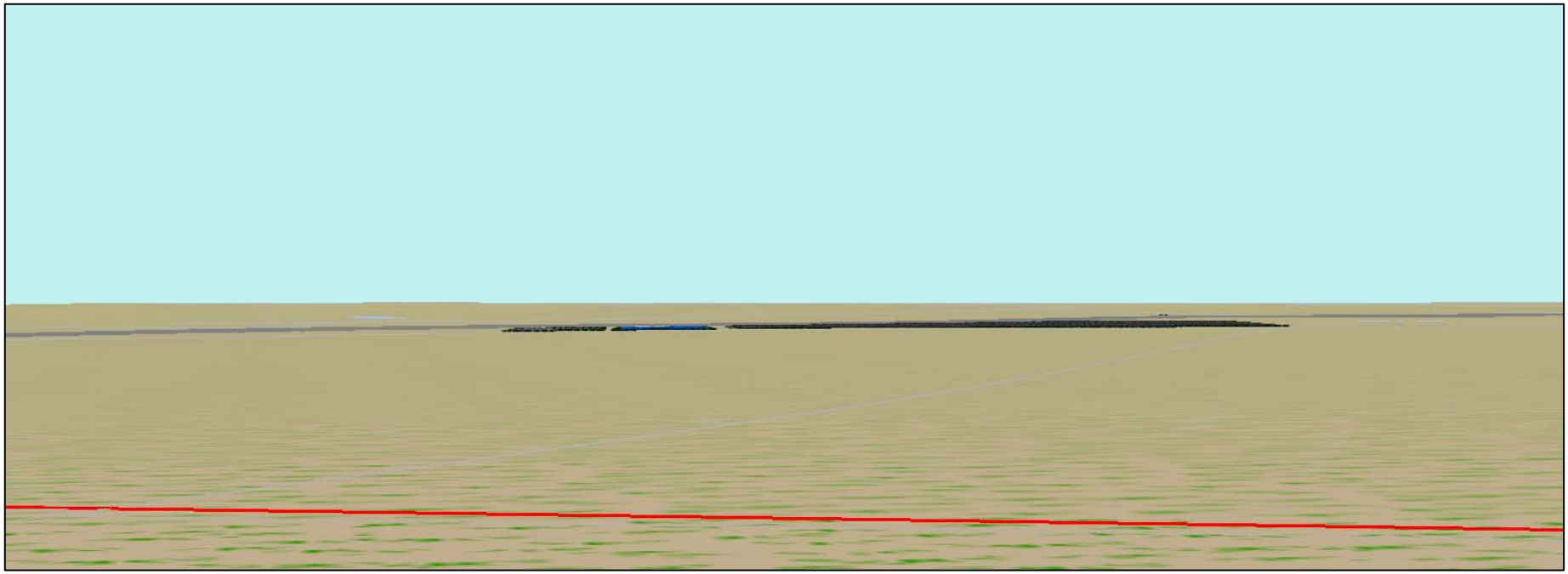
- **Figure 53: Viewshed of Viewpoint R63 (Note that the R63 is indicated by a red line).**

- **Figure 54: Viewpoint R63 – existing view in the direction of the town of Pearston. (Note the R337 is depicted as the grey line near the horizon. The red line in the foreground represents the R63).**



- **Figure 55: Viewpoint R63 – existing view in the direction of the town of Pearston. (Note the R337 is indicated by the red line in the foreground).**

- **Figure 56: Viewpoint R63 – view of proposed solar farm development without mitigation measures in place.**



- **Figure 57: Viewpoint R63 – view of proposed solar farm development with mitigation measures in place.**

D. Conclusion

The viewshed analyses and 3 dimensional visualizations have shown that the proposed solar farm development will be visible from certain viewpoints within the surrounding landscape. These include the residents of the town of Pearston (both southern and northern sections); farms to the east of the development site (Viewpoint 5 Alleengelaten); farms to north of the site (Viewpoint 9 Wildebeeskuil, Viewpoint 10 Bogentwini and Viewpoint 11 Jackson); as well as the road users along both the sections of the R63 and R337.

The proposed solar farm development would not be visible from the view points south and south-east of the development site (Viewpoint 6 Thorngrove, Viewpoint 7 Turksvylaagte and Viewpoint 8 Kransvoëlkuil).

The 3 dimensional visualizations have also shown that distance from the observer to the development is an important consideration when assessing impact. Visual distance/observer proximity is an important factor to consider when determining the impact that the proposed development would have on the surrounding viewpoints. It is generally accepted that visual impact of a structure is reduced as the distance from that structure increases. It is generally assumed that an object will be predominantly visible from an equal distance. The proximity impact decreases exponentially with distance (MetroGIS 2007).

It should be noted that the residents of Pearston's current view can be described as being impacted upon, as their view is currently consists of neighbouring houses, as well as buildings utilized for business and retail. As such even though they will see the development, they currently already see the developments associated with the town of Pearston.

The other viewpoints listed above as being able to see the development, all can see the developments associated with the town of Pearston. As such their views have already been impacted on to a degree and one cannot rate the visual impact the solar farm development would have on the area as high.

In conclusion, even though this proposed development is visible from different surrounding locations north and east of the site, its relative close proximity to the town of Pearston has resulted in the visual quality in this area already being impacted upon. As such the visual impact that this development will have on surrounding areas, should not be rated as high.

i. Possible Mitigation Measures

To reduce the potential visual impact of the proposed development, the following mitigation measures are suggested:

- Trees and shrubs should be planted especially along the boundaries so as to reduce the visual impact on surrounding neighbours. The development proposal has indicated that a 2m high hedge will be planted around the boundary of the proposed development. The 3-dimensional visualisations have shown that this will soften the outer boundary of the development. This will also form an obstruction to the viewers possibly seeing the solar farm development. However, at certain parts of the landscape, especially the viewpoints on higher ground to the north and north-east of the site, the development will be visible.
- External lighting must be minimized. No spot lights should be allowed.

E. References

- MetroGIS March 2007. Visual Impact Assessment. Project Lima – Steelpoort.
- Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes, Department of Environmental Affairs & Development Planning, Western Cape.

Appendix 6: Viewshed Assessment

Appendix 7: Letter from the Department of Agriculture, Rural Development and Agrarian Reform

Province of the
EASTERN CAPE
REPUBLIC OF SOUTH AFRICA

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25 January 2012

Belinda Clark
CEN IEM Unit
36 River Road
Walmer
PORT ELIZABETH
6070

Dear Belinda Clark

Re: Agricultural potential of Portion 2 of the farm KRAAN VOGEL KUIL no.50 in Pearston district in the Blue Crane Route Municipality:

According to CARA (Conservation of Agricultural Resources Act 43 of 1983) the official carrying capacity for the area is 17 ha per large stock unit. CARA seeks to provide for the conservation of natural agricultural resources by maintaining the production potential of land, combating and preventing erosion and weakening or destruction of water resources, protecting vegetation and combating weeds and invader species. According to Veld types of South Africa by J.P.H Acocks it is falling in zone no. 31 - Succulent karoo that consist mainly out of short karoo bushes, succulent plants, scrubs and grasses.

The estimated area needed for a second solar plant on the subject property of 55 MW will require an area of ± 138 ha will mean a loss of only 8.1 Large Stock Units or 54 Small Stock Units. It will not be a total loss as this area can still be utilized by sheep. The solar plants will be fully compatible with veld management systems where they are farming with sheep. None of the grass species or karoo bushes will exceed a height of 0.8 m and scrubs and trees can be mechanical, chemical or biological controlled and those with special value can be incorporated in the layout of the solar plants. The intervention of the solar plants will be minimal.

The department is supporting the proposal and the solar plants are a solution for clean electricity that will not harm the production of natural grazing or complicate the management of our natural veld and will create jobs and generate an income for the area.

André Snyman
Scientist Production Grade A

Appendix 8: Letter from the Blue Crane Route Development Agency

BLUE CRANE DEVELOPMENT AGENCY

Agriculture
Nico Lombard
082 3294545

Business
Rob Beach
082 3294547

Tourism
Chris Wilken
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BLUE CRANE
DEVELOPMENT AGENCY

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CEN Environmental
BCRM
Somerset-East
5850

Date: 24/01/2012

Dear Madam

RE: BCDA: Pearston Solar Project: Proposed construction and operation of a 55 MW solar farm and associated infrastructure on Ptn 2 of the Farm Kraan Vogel Kuil No 50 in Pearston

The Blue Crane Development Agency (BCDA) is the development instrument of the Blue Crane Route Municipality (BCRM). The BCDA belongs 100% to the BCRM and was mandated since 2004 to manage all local development in the municipal region.

As part of our project development efforts to realize the economic growth of our region, we are constantly seeking public as well as private development partnerships that will enable the creation of jobs and business opportunities.

BCDA further pledge our support to the Pearston Solar project as a local IDP registered project that is supported by both the council and the BCDA. The project falls within the scope of the SDFP of the municipality.

BCDA appreciates your support.

Regards,

.....

(C. Wilken: Blue Crane Development Agency)

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