ARCUS CONSULTANCY SERVICES (PTY) LTD

Proposed Development of the Paulputs Wind Energy Facility and associated Grid Connection Infrastructure near Pofadder, Northern Cape Province

Visual Impact Assessment Report – Impact Phase

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Document Title:	Proposed Development of the Paulputs Wind Energy Facility and associated Grid Connection Infrastructure near Pofadder, Northern Cape Province. Visual Impact Assessment Report – Impact Phase
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Version Number:	1
Checked by:	Andrea Gibb
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Signature:	
For:	SiVEST Environmental Division

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

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File Reference Number:	
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Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Proposed Construction of a 300MW Wind Energy Facility and Associated Grid Connection Infrastructure near Pofadder, Northern Cape Province

Kindly note the following:

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Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	SiVEST			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	3	Percentage Procurement recognition	110
Specialist name:	Kerry Schwartz			
Specialist Qualifications:	BA			
Professional affiliation/registration:	SAGC (GISc Technician)			
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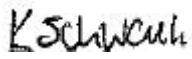
2. DECLARATION BY THE SPECIALIST

I, Kerry Schwartz, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the Specialist

SiVEST

Name of Company:

11 July 2019

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Kerry Schwartz, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

K Schwartz

Signature of the Specialist

SiVEST

Name of Company

11 July 2019

Date

Signature of the Commissioner of Oaths

11 July 2019

Date

Jacqueline Chantel Jackson
COMMISSIONER OF OATHS

Signature:

Divisional Controller
Ref. 9/1/8/2 (R/O) KZN PMB - 08/02/2019

Date: 11/07/2019 Place: PMB
Business Address: VCC Estate, 170 Peter Brown Drive, PMB

National Environmental Management Act, 1998 (Act No. 107 of 1998) and Environmental Impact Regulations (2017) Requirements for Specialist Reports (Appendix 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
(a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a *curriculum vitae*;	**Section 1.4.** Specialist CV's are included in **Appendix A**
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	**Page 3 - 5**
(c) an indication of the scope of, and the purpose for which, the report was prepared;	**Section 1.**
(cA) an indication of the quality and age of base data used for the specialist report;	**Section 1.5.** **Section 3.**
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	**Section 3.** **Section 4.** **Section 5.** **Section 5.2..**
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	**Section 1.3.** **Section 1.5.3.**
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	**Section 1.5.**
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	**Section 3.** **Section 5.** **Section 5.2.**
(g) an identification of any areas to be avoided, including buffers;	**Section 3.3.** **Section 3.5.** **Section 5.**
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	**Section 5.**
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	**Section 1.3.**
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment, or activities;	**Section 5.7**
(k) any mitigation measures for inclusion in the EMPr;	**Section 5.7.**
(l) any conditions for inclusion in the environmental authorisation;	N/A
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	**Section 5.7.**
(n) a reasoned opinion—	**Section 7.1.**

i. as to whether the proposed activity, activities or portions thereof should be authorised; iA. Regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	**No feedback has yet been received from the public participation process regarding the visual environment.**
(p) any other information requested by the competent authority	**No information regarding the visual study has been requested from the competent authority.**
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	**N/A**

ARCUS CONSULTANCY SERVICES SA (PTY) LTD

PROPOSED DEVELOPMENT OF THE PAULPUTS WIND ENERGY FACILITY AND ASSOCIATED GRID CONNECTION INFRASTRUCTURE NEAR POFADDER, NORTHERN CAPE PROVINCE

VISUAL IMPACT ASSESSMENT REPORT – IMPACT PHASE

Contents Page

List of Figures

List of Tables

Appendices

GLOSSARY OF TERMS

ABBREVIATIONS

CSP	Concentrated Solar Power
DEIAR	Draft Environmental Impact Assessment Report
DM	District Municipality
DoE	Department of Energy
DSR	Draft Scoping Report
DTM	Digital Terrain Model
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FEIAR	Final Environmental Impact Assessment Report
FSR	Final Scoping Report
GIS	Geographic Information System
I&AP	Interested and/or Affected Party
IPP	Independent Power Producer
LM	Local Municipality
kV	Kilovolt
MW	Megawatt
NGI	National Geo-Spatial Information
REIPPP	Renewable Energy Independent Power Producer Programme
SACAA	South African Civil Aviation Authority
SAHRA	South African Heritage Resource Agency
SANBI	South African National Biodiversity Institute
SEF	Solar Energy Facility
VIA	Visual Impact Assessment
VR	Visual Receptor
WEF	Wind Energy Facility

DEFINITIONS

Anthropogenic feature: An unnatural feature resulting from human activity.

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

Sense of place: The unique quality or character of a place, whether natural, rural or urban. It relates to uniqueness, distinctiveness or strong identity.

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

Sensitive visual receptors: An individual, group or community that is subject to the visual influence of the proposed development and is adversely impacted by it. They will typically include locations of human habitation and tourism activities.

Sky Space: The area in which the rotors would rotate.

Slope Aspect: Direction in which a hill or mountain slope faces.

Study area: The study area or visual assessment zone is assumed to encompass a zone of 10km from the outer boundary of the proposed WEF application site, and 5km from the proposed grid connection corridor options.

Visual assessment zone: The visual assessment zone or study area or visual assessment zone is assumed encompass a zone of 10km from the outer boundary of the proposed WEF application site, and 5km from the proposed grid connection corridor options.

Viewpoint: A point in the landscape from where a particular project or feature can be viewed.

Viewshed / Visual Envelope: The geographical area which is visible from a particular location.

Visual character: The pattern of physical elements, landforms and land use characteristics that occur consistently in the landscape to form a distinctive visual quality or character.

Visual contrast: The degree to which the development would be congruent with the surrounding environment. It is based on whether or not the development would conform with the land use, settlement density, forms and patterns of elements that define the structure of the surrounding landscape.

Visual exposure: The relative visibility of a project or feature in the landscape.

Visual impact: The effect of an aspect of the proposed development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.

Visual receptors: An individual, group or community that is subject to the visual influence of the proposed development but is not necessarily adversely impacted by it. They will typically include commercial activities, residents and motorists travelling along routes that are not regarded as scenic.

Visual sensitivity: The inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (visual character), spatial distribution of potential receptors, and the likely value judgements of these receptors towards the new development, which are usually based on the perceived aesthetic appeal of the area.

ARCUS CONSULTANCY SERVICES SA (PTY) LTD

PROPOSED DEVELOPMENT OF THE PAULPUTS WIND ENERGY FACILITY AND ASSOCIATED GRID CONNECTION INFRASTRUCTURE NEAR POFADDER, NORTHERN CAPE PROVINCE

VISUAL IMPACT ASSESSMENT REPORT – IMPACT PHASE

1 INTRODUCTION

WKN-Windcurrent (Pty) Ltd (hereafter referred to as WKN-WC) is proposing to construct the 300MW Paulputs Wind Energy facility (WEF) and associated grid connection infrastructure near Pofadder in the Northern Cape Province. WKN-WC has appointed Arcus Consultancy Services SA (Pty) Ltd (hereafter referred to as Arcus) to undertake the Environmental Impact Assessment (EIA) required for the proposed development.

SiVEST has been appointed to undertake a visual impact assessment (VIA) for the proposed construction of the Paulputs WEF as part of the EIA study being conducted by Arcus. During the Scoping Phase of the EIA, a scoping-level VIA was conducted with the aim of identifying potential visual issues associated with the development of the proposed WEF, and determining the potential extent of visual impacts. This study characterised the visual environment of the area and identified areas of potential visual sensitivity, with the main focus on the potentially sensitive visual receptor locations. In addition, the study provided an assessment of the magnitude and significance of the visual impacts associated with the proposed development.

The focus of the EIA phase assessment will be to update the scoping phase VIA report to incorporate any new information that may have come to light and to accommodate any amendments and/or refinements to the project proposals. This will entail:

- further assessment of the visual impact of the WEF and associated grid connection on the sensitive receptor locations where necessary;
- further assessment of the cumulative impacts that could result from other renewable energy developments in the broader area;
- addressing any comments or concerns arising from the public participation process, and
- a review of the findings of the VIA in light of amendments and refinements to the site layout and turbine placements.

1.1 Project Description

At this stage it is proposed that the WEF, comprising wind turbines and associated infrastructure will have a total generation capacity of 300MW. The generated electricity will be

fed into the national grid via a 132kV power line either at the Paulputs Substation or by way of a tie-in with existing 132kV power lines. The total size of the application site is 11 813 ha, although the developable area is less than 10 000 ha and the actual infrastructure footprint is only around 2% of this.

The key components of the project are detailed below and the amended layout and grid connection proposals are shown in **Figure 1** and **Figure 2**.

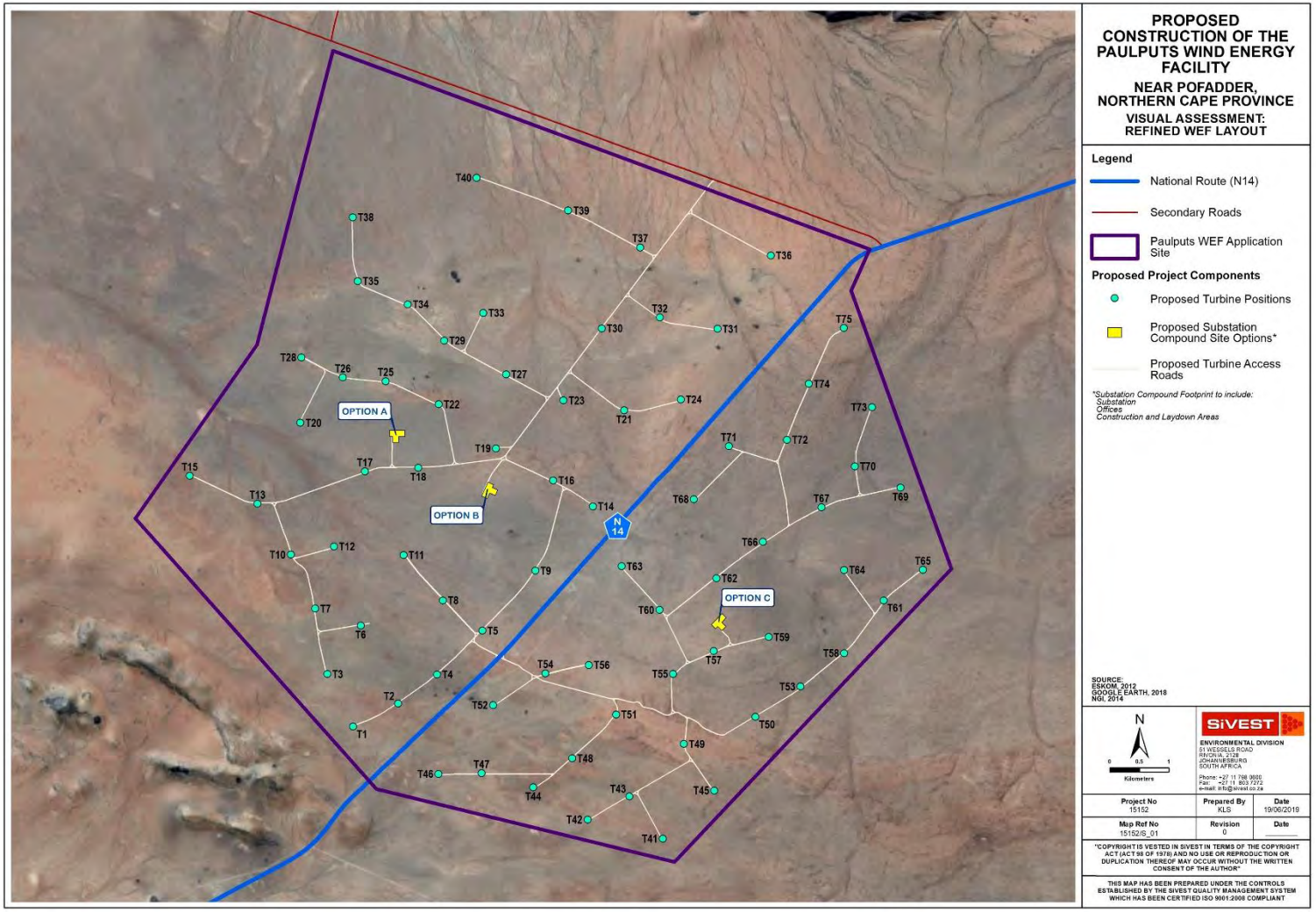


Figure 1: Amended WEF Layout

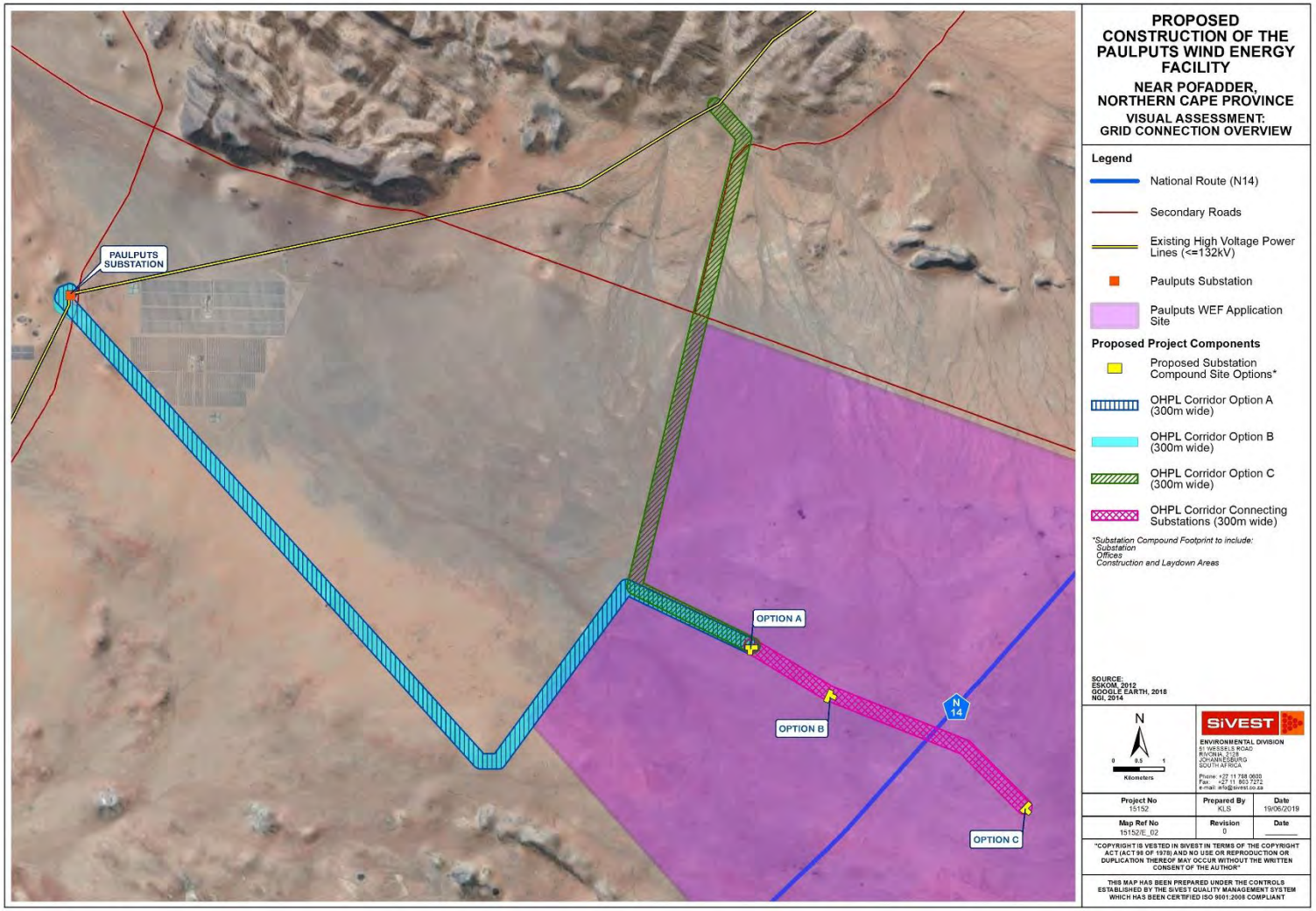


Figure 2: Grid Connection Overview

1.1.1 Wind Turbines

It was initially proposed that the Paulputs WEF development would comprise a maximum of 85 wind turbines, although the actual number of turbines would be determined by the generation capacity of the selected turbine, which will range from 3 MW minimum to 6 MW maximum. Initial turbine specifications proposed included a maximum hub height of 140m and a maximum rotor diameter of 160m (ie a maximum height of 220m at blade tip.

Following on from the scoping-phase specialist reports, WKN-WC has revised the proposed turbine layout for Paulputs WEF and reduced the number of turbines to 75. Turbine specifications proposed for this revised layout include a maximum hub height of 140m and a maximum rotor diameter of 180m, with a maximum height of 230m at blade tip (**Figure 3**).

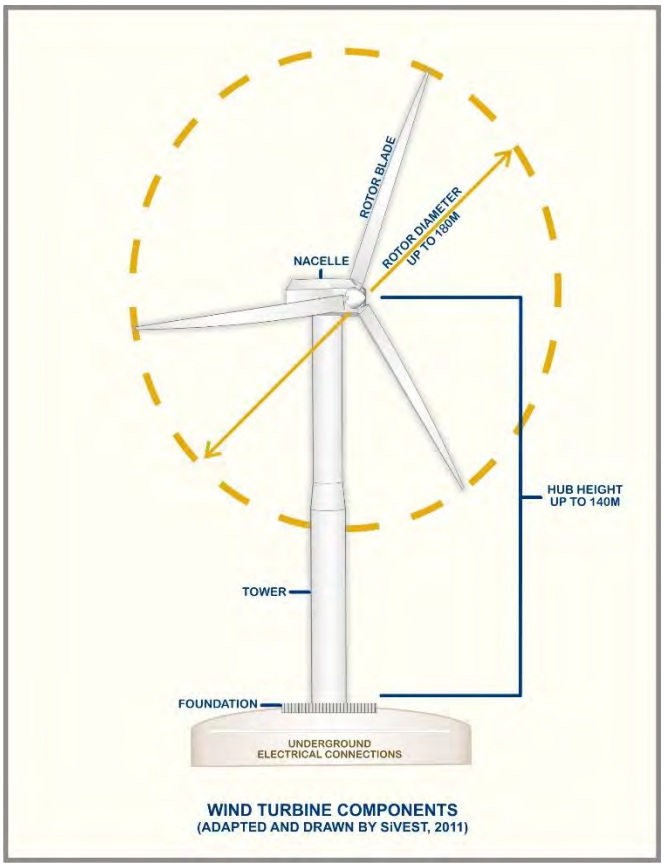


Figure 3: Typical components of a wind turbine

1.1.2 Wind Farm Electrical Infrastructure

Medium voltage underground cabling will connect the turbines to an on-site substation. Where underground cabling is not feasible, such as river crossings and road crossings, overhead cabling will be required (**Figure 4**).

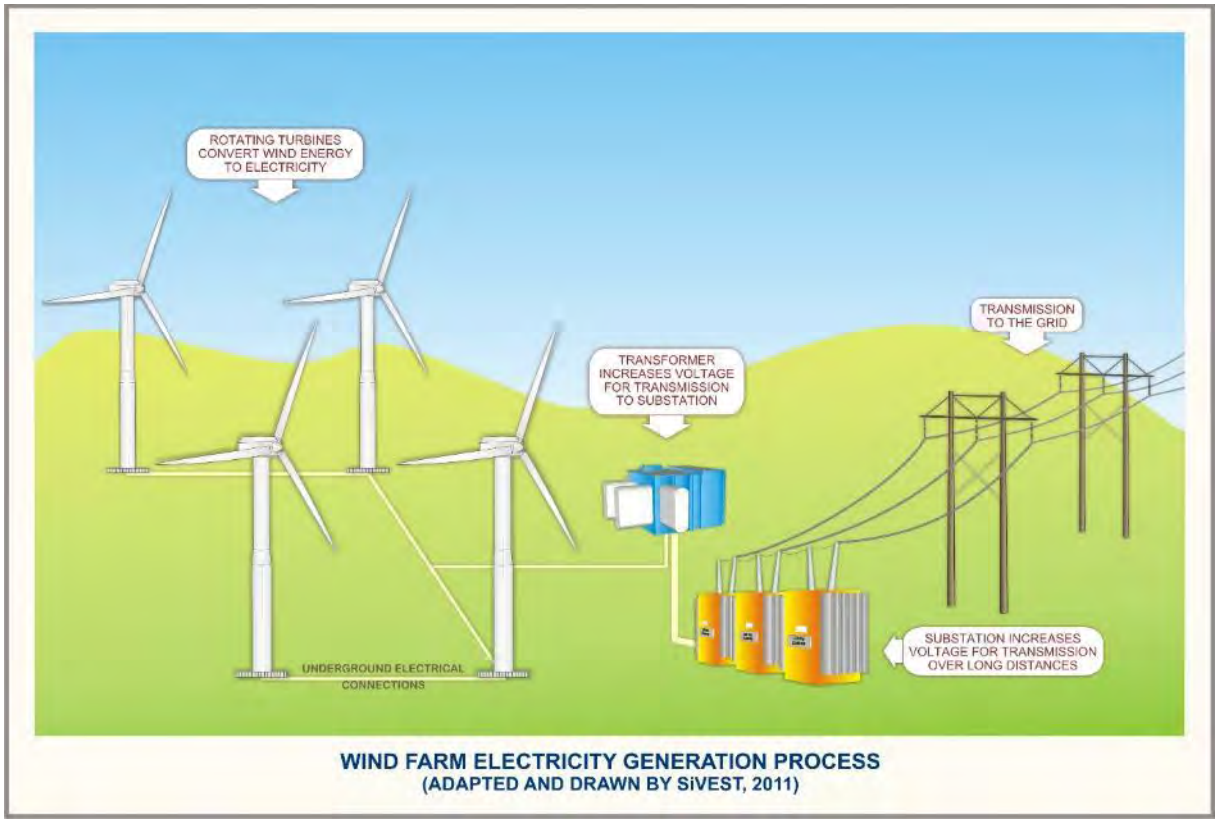


Figure 4: Conceptual wind farm electricity generation process showing electrical connections

The new on-site substation will be located within a designated substation compound site which will also accommodate the laydown area, construction yard and offices. Although the total area of the site will be approximately 4 hectares (ha), the substation will only occupy approximately 1.1ha. Three substation compound site options have been identified for assessment during the EIA process.

Electricity will be fed into the national grid by a new 132kV power line connecting the on-site substation to either Paulputs substation or to the existing 132kV power lines. Four (4) alternative route alignments for this power line are being assessed as part of the EIA. These options are as follows:

- Corridor Option A (300m corridor) is approximately 20kms in length, providing a direct link to Paulputs substation.
- Corridor Option B (300m corridor) is also approximately 20kms in length providing a link to Paulputs substation via the collector substation on the Konkoonsies SEF development site. The alignment of this route is almost identical to Corridor Option B, with just a small deviation to incorporate the collector substation.
- Corridor Option C (300m corridor) is approximately 12km in length, running northwards from the WEF to connect with the existing 132kV power line.
- The fourth Corridor Option (300m corridor) is approximately 6kms in length and is situated entirely on the WEF application site, providing a link between the proposed substation site options.

It is understood that the substation and grid options are not alternatives and are all included in the EA application.

Power line corridors are being assessed to allow flexibility when determining the final route alignment. The proposed power line however only requires a 31m wide servitude and as such, this servitude would be positioned within the corridor.

The type of power line towers being considered at this stage include both lattice and monopole towers and it is assumed that these towers will be located approximately 200m to 250m apart. The towers will be a maximum of 30m in height, but will ensure minimum overhead line clearances from buildings and surrounding infrastructure. The exact location of the towers will be determined during the final design stages of the power line.

1.1.3 Other Infrastructure

Additional infrastructure required for the proposed WEF will include the following:

- Hardstand areas at the base of each turbine to accommodate the turbine base and crane pad. These areas will cover a maximum of 0.8 ha each, or a total of 60 ha for all 75 turbines.
- A permanent laydown area and a temporary construction laydown area of approximately 1ha each, located within the substation compound site.
- Operations and maintenance (O&M) buildings, including a parking area and battery storage, occupying an area of approximately 2ha of the substation compound site.
- Internal roads up to 12m wide (6m wide road surface plus 3m each side for road reserve and drainage). The total length of road is estimated to be 80 km of roads, and where possible, this will include the upgrade of existing tracks to avoid the construction of roads through pristine, unspoilt areas.
- Wire mesh or chain link fencing, up to 2.6m high will be erected around the substation site.
- Security lighting will be provided on top of the boundary turbines if required by SACAA.

1.2 Site Location

The proposed WEF is located approximately 50km east of Pofadder in the Northern Cape Province and straddles the boundary between the Khai-Ma and the Kai !Garib Local Municipalities within the Namkwa and Siyanda District Municipalities respectively (**Figure 5**). The application site for the proposed WEF, as shown on the locality map below (**Figure 6**), is approximately 11 813 ha in extent and is situated on the following farm portions:

- Portions 2, 3 and 5 of the Farm Skuit Klip No 92, and
- Portions 1, 2, 4, 8 and 9 of the Farm Lucas Vlei No 93.

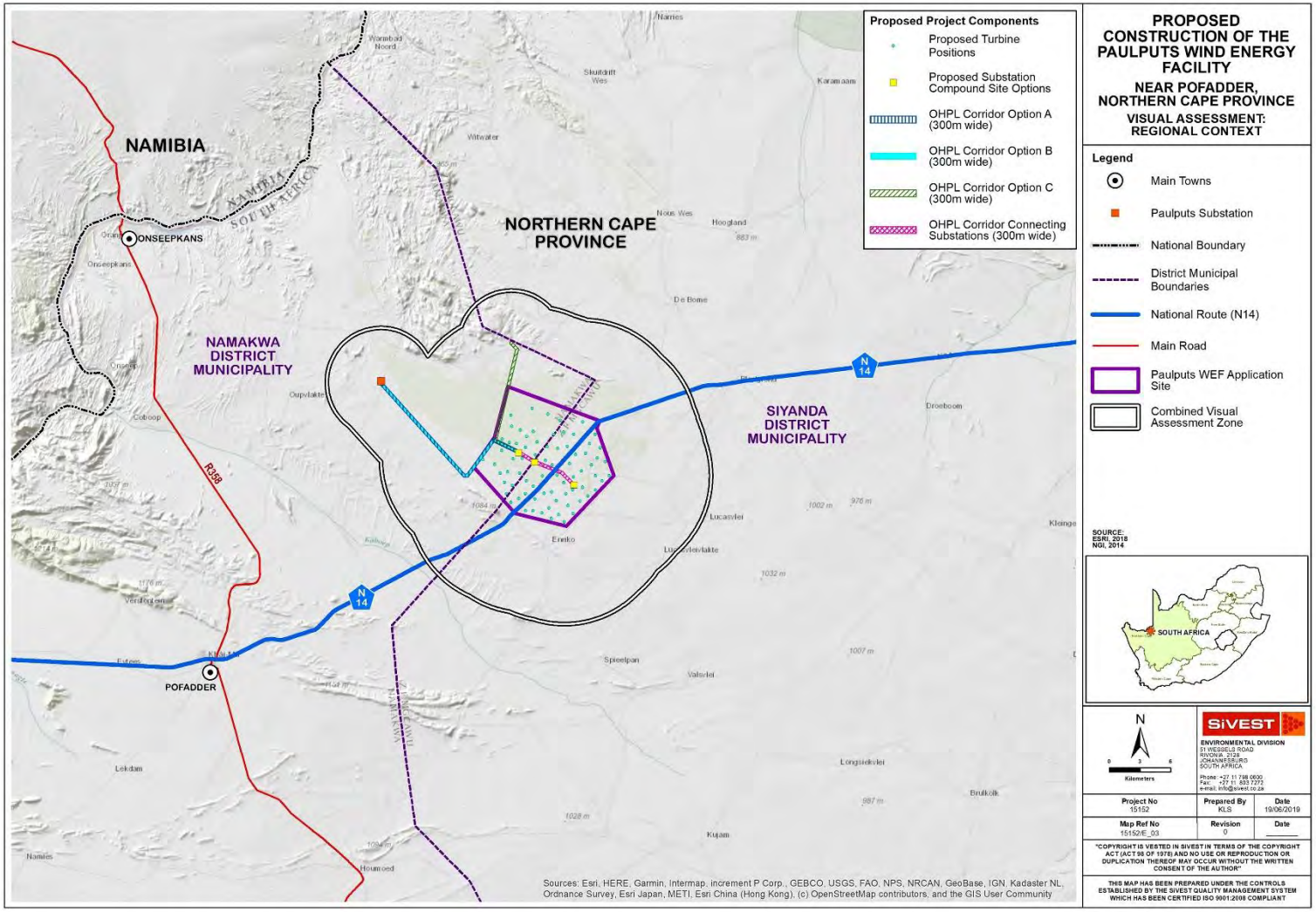


Figure 5: Regional Context Map

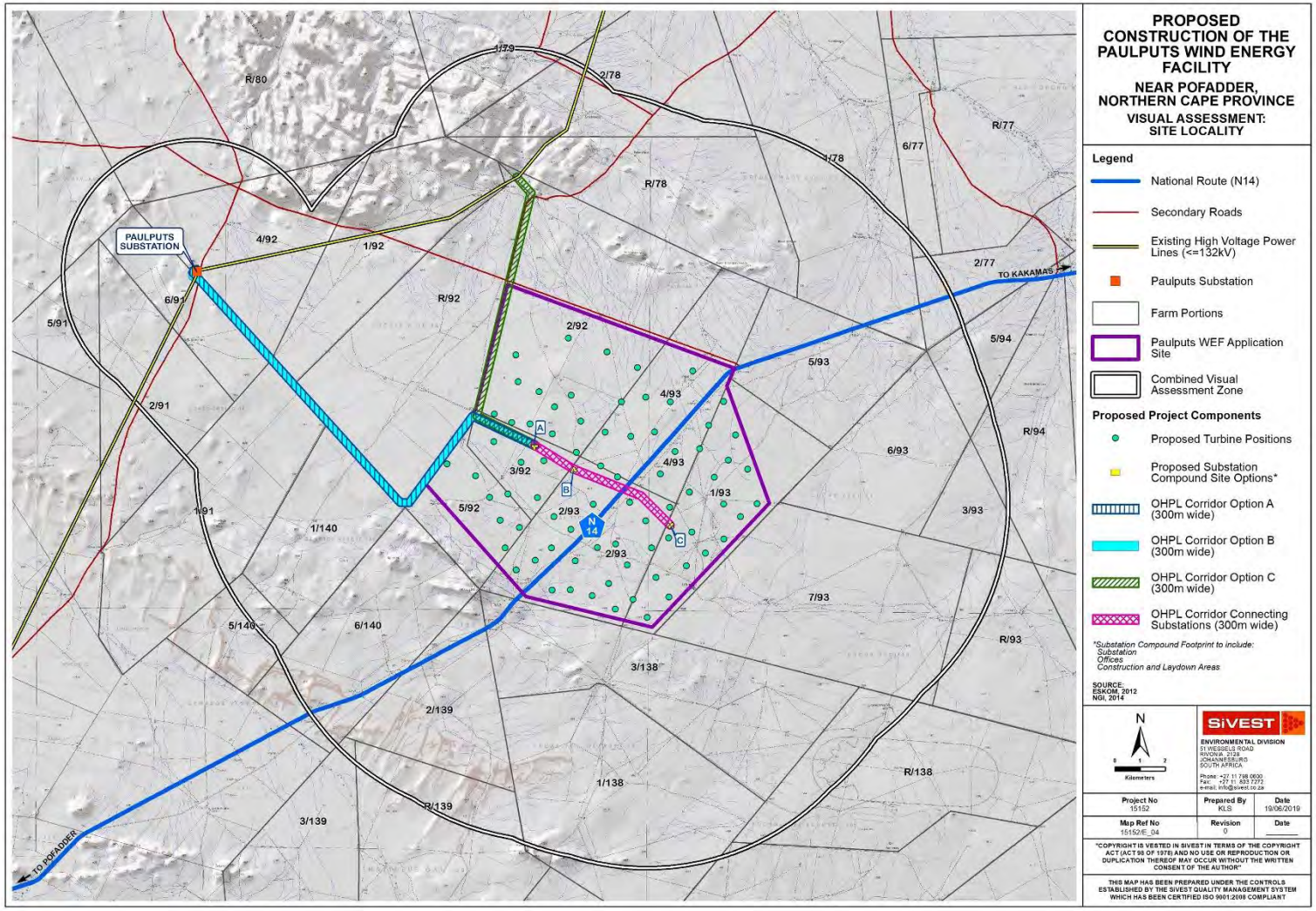


Figure 6: Site Locality

1.3 Assumptions and Limitations

- The identification of visual receptors involved a combination of desktop assessment as well as field-based observation undertaken during the scoping phase of the project. Initially Google Earth imagery was used to identify potential receptors within the study area. Where possible, these receptor locations were verified and assessed during a site visit which was undertaken between the 26th and the 28th of November 2018. Due to the extent of the study area however, and the fact that many of the identified receptors are farm houses on private property, it was not possible to visit or verify every potentially sensitive visual receptor location. As such, a number of broad assumptions have been made in terms of the likely sensitivity of the receptors to the proposed development. It should be noted that not all receptors would necessarily perceive the proposed development in a negative way. This is usually dependent on the use of the facility, the economic dependency of the occupants on the scenic quality of views from the facility and on people's perceptions of the value of "Green Energy". Sensitive receptor locations typically include sites such as tourism facilities and scenic locations within natural settings which are likely to be adversely affected by the visual intrusion of the proposed development. Thus the presence of a receptor in an area potentially affected by the proposed development does not necessarily mean that a visual impact will be experienced.

- Wind turbines are very large structures and could impact on visual receptors that are located relatively far away, particularly in areas where the terrain is very flat. Given the nature of the receiving environment and the height of the proposed wind turbines, the study area or visual assessment zone is assumed to encompass an area of 10km from the boundary of the WEF application site. This limit on the visual assessment zone relates to the fact that visual impacts decrease exponentially over distance. Thus although the wind turbines may still be visible beyond 10km, the degree of visual impact would diminish considerably. As such, the need to assess the impact on potential receptors beyond this distance would not be warranted.

- In assessing the potential visual impacts for the proposed 132kV power line, the visual assessment zone is assumed to encompass a zone of 5km from the outer boundary of the power line assessment corridors. It should be noted that an additional grid connection option is being considered in this phase of the project and as such the area now being assessed is somewhat larger that the area assessed in the scoping phase of the project.

- For the purposes of the EIA-level study, all modelling and analysis is based on a worst case scenario where the structure height has been assumed to be 230m (at blade tip).

- Due to the varying scales and sources of information; maps may have minor inaccuracies. Terrain data for this area derived from the National Geo-Spatial Information (NGI)'s 25m DEM is fairly coarse and somewhat inconsistent and as such,

localised topographic variations in the landscape may not be reflected on the Digital Elevation Model (DEM) used to determine viewsheds.

- A preliminary viewshed based on the turbine layout provided, showed that no screening would be provided by the topography and as such the proposed development would be visible from all areas within a 10km radius of the application site. Accordingly, no viewshed maps have been included in this report.

- The potential visual impact at each visual receptor location was assessed using a matrix developed for this purpose. The matrix is based on three main parameters relating to visual impact and, although relatively simplistic, it provides a reasonably accurate indicative assessment of the degree of visual impact likely to be experienced at each receptor location as a result of the proposed development. It is however important to note the limitations of quantitatively assessing a largely subjective or qualitative type of impact and as such the matrix should be seen as merely a representation of the likely visual impact at a receptor location.

- Comments received from South African Heritage Resource Agency (SAHRA) during the scoping phase of the process have been addressed and incorporated into this report. Any further feedback from the public during the review period of the Draft Environmental Impact Assessment Report (DEIAR) will be incorporated into further drafts of this report.

- At the time of undertaking the visual study there was no information available regarding the type and intensity of lighting that will be required for the proposed WEF and thus the potential impact of lighting at night has not been assessed at a detailed level. However, lighting requirements are relatively similar for all WEFs and as such, general measures to mitigate the impact of additional light sources on the ambiance of the nightscape have been provided.

- This study includes an assessment of the potential cumulative impacts of other renewable energy developments on the existing landscape character and on the identified sensitive receptors. This assessment is based on the information available at the time of writing the report and where information has not been available, broad assumptions have been made as to the likely impacts of these developments.

- At the time of writing this report, the proposed turbine layout, (including the choice of turbine size) was still in the preliminary design phase and as such, no visualisation modelling was undertaken for the WEF project. Although the WEF will introduce a new development in the area and result in some change to the visual character, the area is not regarded as a protected landscape. This can however be provided should the Public Participation process identify the need for this exercise.

- It should be noted that the site visit was undertaken in the last week of November 2018, during early summer. Typically, the visual impact of a WEF development would be less significant during the rainy periods of the year than it would during the drier periods when the surrounding vegetation is expected to provide less potential screening. The study area is however typically characterised by low levels of rainfall all year round and

therefore the time of the year is not expected to affect the significance of the visual impact of the proposed development. In addition, the vegetation cover within the study area is largely dominated by low shrubs and thus vegetation cover is not expected to have a significant effect on the visual impact of the proposed development.

- The weather conditions in the study area also affect the visual impact of the proposed development to some degree. The site visit was undertaken in clear weather conditions which tend to prevail for most of the year due to the low levels of rainfall in the area. In these clear conditions, wind turbines would present a greater contrast with the surrounding landscape than they would during overcast conditions. The weather conditions during the time of the study were therefore taken into consideration when undertaking this VIA.

1.4 Specialist Credentials

This VIA has been undertaken by Kerry Schwartz and reviewed by Andrea Gibb from SiVEST. Andrea Gibb has 11 years' work experience and specialises in undertaking visual impact and landscape assessments, by making use of ArcGIS technology and field surveys. Andrea's relevant VIA project experience is listed in the table below.

Environmental Practitioner	SiVEST (Pty) Ltd – Andrea Gibb
Contact Details	andreag@sivest.co.za
Qualifications	BSc Landscape Architecture and BSc (Hons) Environmental Management
Expertise to carry out the Visual Impact Assessment.	**Visual Impact Assessments:** ▪ VIA for the proposed Rondekop WEF near Sutherland, Northern Cape Province. ▪ VIA (BA) for the proposed Tooverberg WEF near Touws River, Western Cape Province. ▪ VIAs (Scoping and Impact Phase) for the proposed Graskoppies Wind Farm near Loeriesfontein, Northern Cape Province. ▪ VIAs (Scoping and Impact Phase) for the proposed Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province. ▪ VIAs (Scoping and Impact Phase) for the proposed Ithemba Wind Farm near Loeriesfontein, Northern Cape Province. ▪ VIAs (Scoping and Impact Phase) for the proposed Xha! Boom Wind Farm near Loeriesfontein, Northern Cape Province ▪ VIA (Scoping Phase) for the proposed 3000MW Wind Farm and associated infrastructure near Richmond, Northern Cape Province. ▪ VIA for the proposed construction of a power line and associated infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberley, Free State and Northern Cape Provinces.

	▪ VIA for the proposed construction of a power line and associated infrastructure for the proposed Rooipunt Solar Thermal Power Plant near Upington, Northern Cape Province. ▪ VIAs (Scoping and Impact Phase) for the proposed Sendawo 1, 2 and 3 solar PV energy facilities near Vryburg, North West Province. ▪ VIAs (Scoping and Impact Phase) for the proposed Tlisitseng 1 and 2 solar PV energy facilities near Lichtenburg, North West Province. ▪ VIAs (Scoping and Impact Phase) for the proposed construction of the Sendawo substation and associated 400kV power line near Vryburg, North West Province. ▪ VIAs (Scoping and Impact Phase) for the proposed Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province. ▪ VIA for the proposed Nokukhanya 75MW Solar PV Power Plant near Dennilton, Limpopo Province. ▪ VIAs (Scoping and Impact Phase) for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province. ▪ VIA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province. ▪ VIA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province.

Kerry Schwartz is a GIS specialist with more than 20 years' experience in the application of GIS technology in various environmental, regional planning and infrastructural projects undertaken by SiVEST. Kerry's GIS skills have been extensively utilised in projects throughout South Africa and in other Southern African countries. Kerry has also been involved in the compilation of VIA reports. Kerry's relevant VIA project experience is listed in the table below.

Environmental Practitioner	SiVEST (Pty) Ltd – Kerry Schwartz
Contact Details	kerrys@sivest.co.za
Qualifications	BA (Geography), University of Leeds 1982
Expertise to carry out the Visual Impact Assessment.	**Visual Impact Assessments:** ▪ VIA for the proposed Rondekop WEF near Sutherland, Northern Cape Province. ▪ VIA (BA) for the proposed Tooverberg WEF near Touws River, Western Cape Province. ▪ VIA (BA) for the proposed development of the Kudusberg WEF near Sutherland, Northern and Western Cape Provinces. ▪ VIA (Scoping and Impact Phase) for the proposed development of the Kuruman Wind Energy Facility near Kuruman, Northern Cape Province.

	▪ VIA (Scoping and Impact Phase) for the proposed development of the Phezukomoya Wind Energy Facility near Noupoort, Northern Cape Province. ▪ VIA (Scoping and Impact Phase) for the proposed development of the San Kraal Wind Energy Facility near Noupoort, Northern Cape Province. ▪ VIAs (Scoping and Impact Phase) for the proposed Graskoppies Wind Farm near Loeriesfontein, Northern Cape Province. ▪ VIAs (Scoping and Impact Phase) for the proposed Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province. ▪ VIAs (Scoping and Impact Phase) for the proposed Ithemba Wind Farm near Loeriesfontein, Northern Cape Province. ▪ VIAs (Scoping and Impact Phase) for the proposed Xha! Boom Wind Farm near Loeriesfontein, Northern Cape Province ▪ Visual Impact Assessments for 5 Solar Power Plants in the Northern Cape ▪ Visual Impact Assessments for 2 Wind Farms in the Northern Cape ▪ Visual Impact Assessment for Mookodi Integration Project (132kV distribution lines) ▪ Landscape Character Assessment for Mogale City Environmental Management Framework

Full CVs are attached as **Appendix A**.

1.5 Assessment Methodology

As mentioned above, this VIA has been based on a desktop-level assessment supported by field-based observation.

1.5.1 Physical landscape characteristics

Physical landscape characteristics such as topography, vegetation and land use are important factors influencing the visual character and visual sensitivity of the study area. Baseline information about the physical characteristics of the study area was initially sourced from spatial databases provided by NGI, the South African National Biodiversity Institute (SANBI) and the South African National Land Cover Dataset (Geoterraimage – 2014). The characteristics identified via desktop means were later verified during the site visit.

1.5.2 Identification of sensitive receptors

Visual receptor locations and routes identified in the study area during the scoping phase of the project were re-assessed in order to determine the impact of the amended and/or refined WEF proposals on each of the identified receptor locations.

1.5.3 Fieldwork and photographic review

Fieldwork undertaken during the scoping phase of the VIA involved a two (2) day site visit undertaken between the 26th and the 28th of November 2018 (early summer). The purpose of the site visit was to;

- verify the landscape characteristics identified via desktop means;
- conduct a photographic survey of the study area;
- verify, where possible, the sensitivity of visual receptor locations identified via desktop means;
- eliminate receptor locations that are unlikely to be influenced by the proposed development;
- identify any additional visually sensitive receptor locations within the study area; and
- inform the impact rating assessment of visually sensitive receptor locations (where possible).

The findings of the field assessment have been used to inform the EIA-level VIA and no further fieldwork was considered necessary.

1.5.4 Impact Assessment

A rating matrix, as provided by Arcus, was used to objectively evaluate the significance of the visual impacts associated with the proposed development, both before and after implementing mitigation measures. Mitigation measures were identified (where possible) in an attempt to minimise the visual impact of the proposed development. The rating matrix made use of a number of different factors including severity, geographical extent, duration, consequence and probability, in order to assign a level of significance to the visual impact of the project.

A separate rating matrix was used to assess the visual impact of the proposed development on each visual receptor location, as identified. This matrix is based on three (3) parameters, namely the distance of an identified visual receptor from the proposed development, the presence of screening factors and the degree to which the proposed development would contrast with the surrounding environment.

1.5.5 Consultation with I&APs

Continuous consultation with Interested and Affected Parties (I&APs) undertaken during the public participation process will be used (where available) to help establish how the proposed development will be perceived by the various receptor locations and the degree to which the impact will be regarded as negative. Feedback received from the public during the review period of the Draft Environmental Impact Assessment Report (DEIAR) will be incorporated into further drafts of this report.

Comments received from South African Heritage Resource Agency (SAHRA) during the scoping phase of the EIA have been addressed and incorporated into this report (**Section 6**).

2 FACTORS INFLUENCING VISUAL IMPACT

2.1 Subjective experience of the viewer

The perception of the viewer/receptor toward an impact is highly subjective and involves 'value judgements' on behalf of the receptor. It is largely based on the viewer's perception and is usually dependent on the age, gender, activity preferences, time spent within the landscape and traditions of the viewer (Barthwal, 2002). Thus certain receptors may not consider a WEF to be a negative visual impact as it is often associated with employment creation, social up-liftment and the general growth and progression of an area, and could therefore have positive connotations.

2.2 Visual environment

WEFs and associated grid connection infrastructure developments are not features of the natural environment, but are rather a representation of human (anthropogenic) alteration. As such, these developments are likely to be perceived as visually intrusive when placed in largely undeveloped landscapes that have a natural scenic quality and where tourism activities, based upon the enjoyment of or exposure to the scenic or aesthetic character of the area, are practiced. Residents and visitors to these areas could perceive the wind turbines, power lines and substations to be highly incongruous in this context and may regard these features as an unwelcome intrusion which degrade the natural character and scenic beauty of the area, and which could potentially even compromise the practising of tourism activities in the area. The experience of the viewer is however highly subjective and there are those who may not perceive features such as wind turbines and power lines as a visual intrusion.

The presence of other anthropogenic features associated with the built environment may not only obstruct views but also influence the perception of whether a development is a visual impact. In industrial areas for example, where other infrastructure and built form already exists, the visual environment could be considered to be 'degraded' and thus the introduction of a WEF

into this setting may be considered to be less visually intrusive than if there was no existing built infrastructure visible.

2.3 Type of visual receptor

Visual impacts can be experienced by different types of receptors, including people living, working or driving along roads within the viewshed of the proposed development. The receptor type in turn affects the nature of the typical 'view', with views being permanent in the case of a residence or other place of human habitation, or transient in the case of vehicles moving along a road. The nature of the view experienced affects the intensity of the visual impact experienced.

It is important to note that visual impacts are only experienced when there are receptors present to experience this impact. Thus where there are no human receptors or viewers present there are not likely to be any visual impacts experienced.

2.4 Viewing distance

Viewing distance is a critical factor in the experiencing of visual impacts, as beyond a certain distance, even large developments tend to be much less visible, and difficult to differentiate from the surrounding landscape. The visibility of an object is likely to decrease exponentially as one moves away from the source of impact, with the impact at 1 000m being considerably less than the impact at a distance of 500m. **(Figure 7)**.

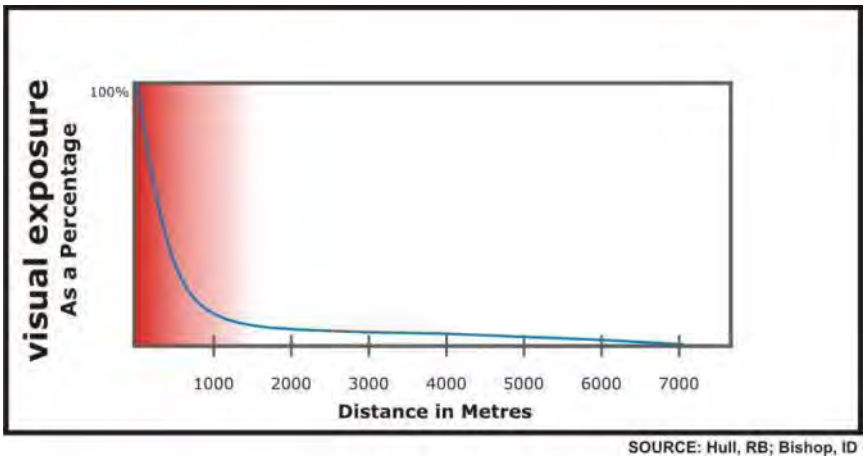


Figure 7: Conceptual representation of diminishing visual exposure over distance

3 VISUAL CHARACTER AND SENSITIVITY OF THE STUDY AREA

Defining the visual character of an area is an important part of assessing visual impacts as it establishes the visual baseline or existing visual environment in which the development would

be constructed. The visual impact of a development is measured by establishing the degree to which the development would contrast with, or conform to, the visual character of the surrounding area. The inherent sensitivity of the area to visual impacts or visual sensitivity is thereafter determined, based on the visual character, the economic importance of the scenic quality of the area, inherent cultural value of the area and the presence of visual receptors.

Physical and land use related characteristics, as outlined below, are important factors contributing to the visual character of an area.

3.1 Physical and Land Use Characteristics

3.1.1 Topography

The site proposed for the Paulputs WEF development is located in the Pofadder region of the Northern Cape which is generally associated with relatively flat landscapes and wide vistas. The topography in the study area is characterised by flat, gently undulating plains interspersed with isolated hills and koppies (**Figure 8**). Areas of greater relief occur in the north-west of the study area where the Ysterberg and the Swartberg hills dominate the landscape (**Figure 9**).

Maps showing the topography and slopes within and in the immediate vicinity of the proposed application site are provided in **Figure 12** and **Figure 13**.

Figure 8: View west across the WEF application site from N14 showing flat to gently undulating landscape with localised hills and koppies.

Figure 9: View from the north-west boundary of the WEF application site showing the low hills which dominate the north-western sector of the study area.

Visual Implications

The flat terrain characteristic of the broader area results in generally wide-ranging vistas throughout the study area and the horizon is usually visible across an entire 360° arc of the viewer's vista (**Figure 10** and **Figure 11**). The only exceptions to this flat topography are the isolated hills and koppies which occur across the study area and the range of hills located in the north-west which only marginally constrain the viewshed.

Bearing in mind that wind turbines are very large structures (with a maximum height at the blade tip of up to 230m), with little to no topographic shielding, these will be visible from a very wide radius around the WEF application site. Although power lines are far less prominent structures than wind turbines, at a maximum height of 30m, the pylons and the steel structures of the proposed substation are also likely to be visible from many of the locally-occurring receptor locations.

Figure 10: View north-east across the study area showing typical wide-ranging vistas.

Figure 11: View south-south-west across the WEF application site.

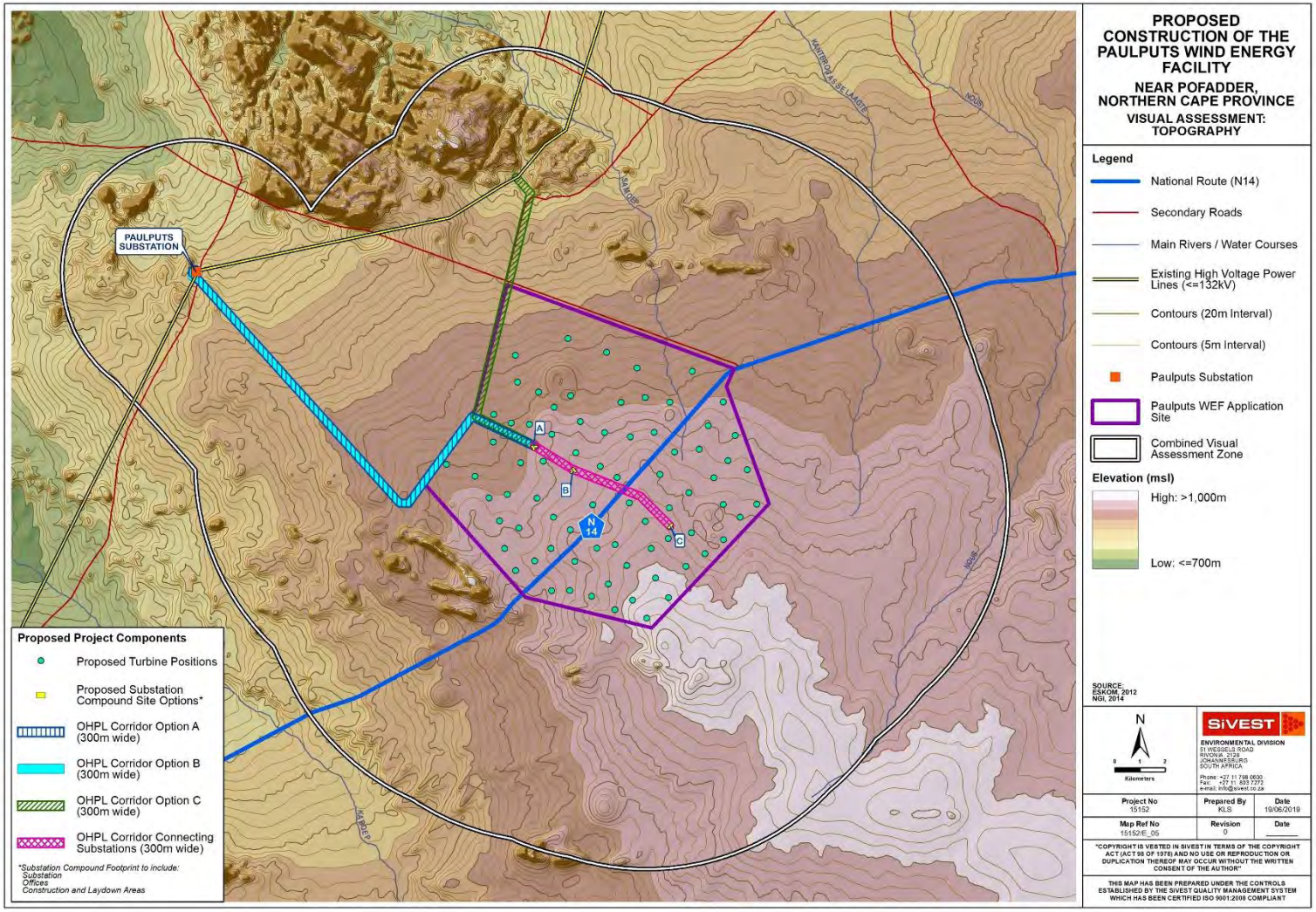


Figure 12: Topography of the study area

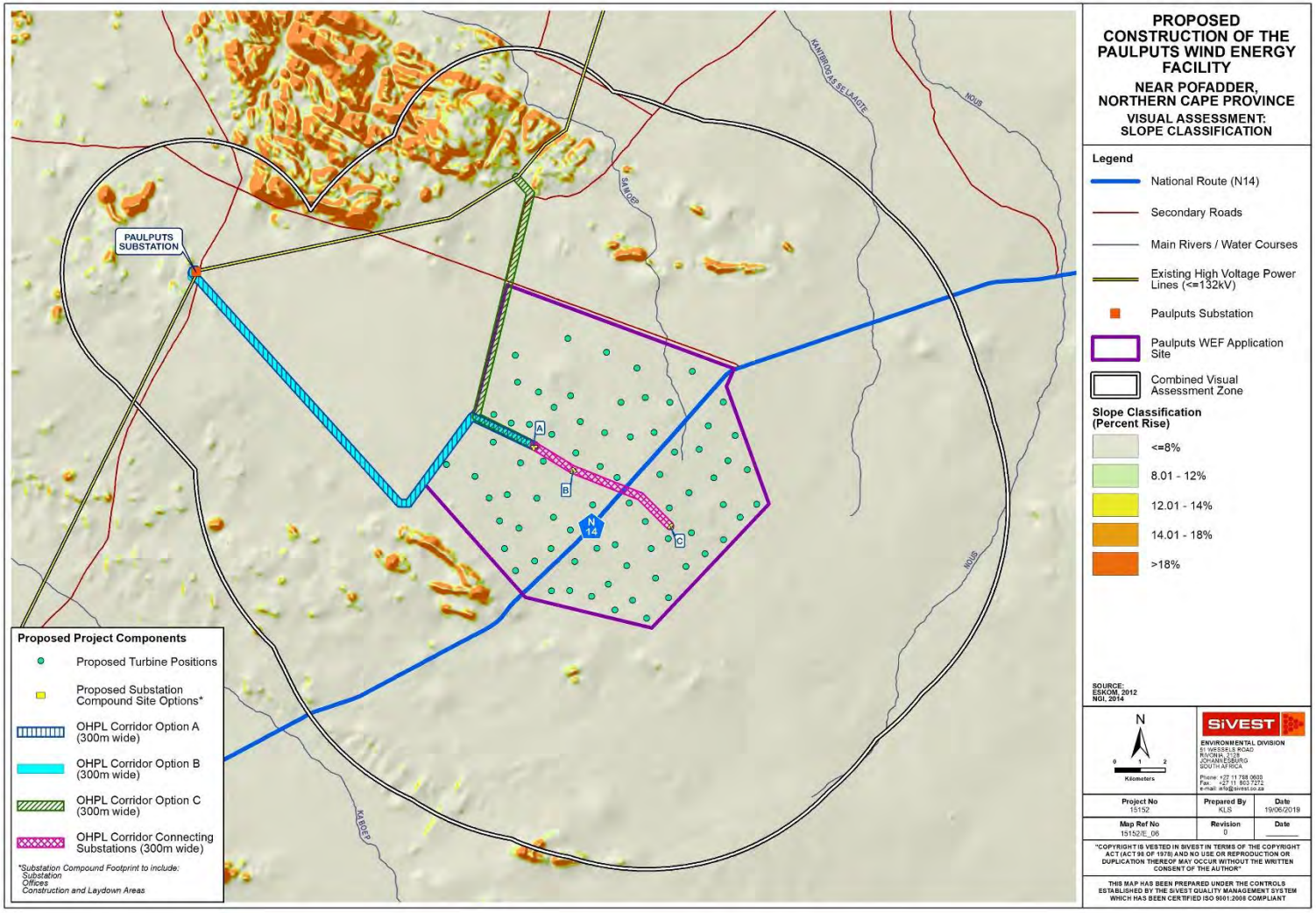


Figure 13: Slope Classification in the study area

3.1.2 Vegetation

According to Mucina and Rutherford (2012), much of the study area is covered by the Bushmanland Arid Grassland vegetation type (**Figure 14**) which tends to occur on extensive to irregular plains extending from Aggeneys in the west to Prieska in the east. Vegetation cover on these plains tends to comprise sparse grassland, with some incidence of low shrubland. The hills in the north-east however support the Lower Gariep Broken Veld vegetation type which is characterised by shrubland (**Figure 15**).

Some tree species are also present in the study area, particularly where exotic tree species and other typical garden vegetation has been established around farmsteads. (**Figure 16**).

Much of the study area however is still characterised by natural low shrubland with transformation limited to a few isolated areas where pastoral activities such as livestock rearing are taking place.

Visual Implications

Vegetation cover across the study area is predominantly short and sparse and thus will not provide any visual screening. In some instances however, tall exotic trees planted around farmhouses may restrict views from receptor locations.

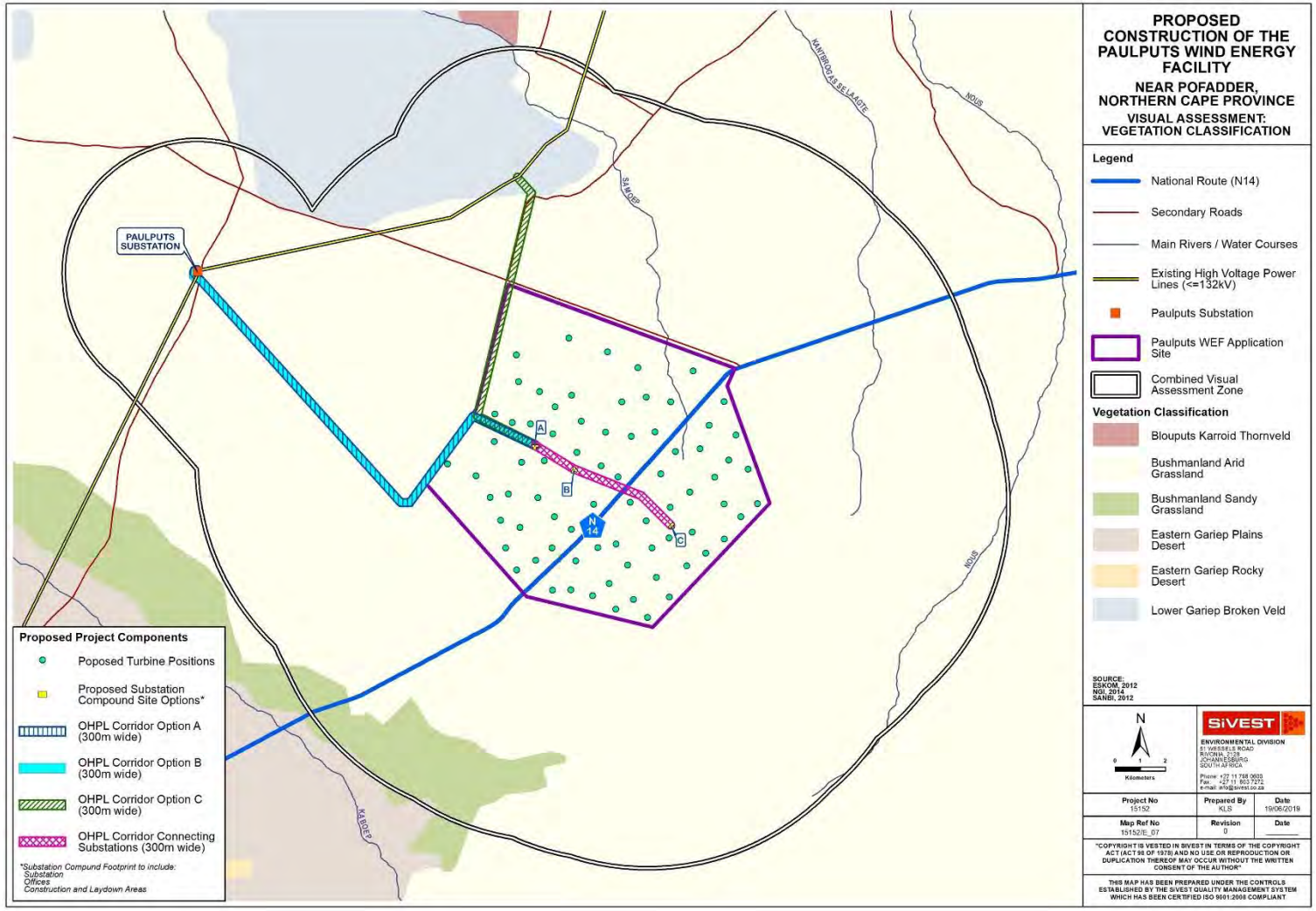


Figure 14: Vegetation Classification

Figure 15: Typical vegetation cover across much of the study area

Figure 16: Example of trees established around a farmhouse in the area

3.1.3 Land Use

According to the South African National Land Cover dataset (Geoterraimage 2014), large sections of the visual assessment area are characterised by low shrubland and areas classified as 'Bare (None Vegetated)'. While some of these 'bare' areas may be representative of transformation due to human activity, in most cases these patches of land are undisturbed areas with very sparse vegetation cover. Although a significant portion of the WEF application site is classified as woodland / open bush, interspersed with patches of ticket / dense bush, much of the natural vegetation cover appears to be consistently sparse across the site (**Figure 17**).

Agricultural activity in the area is severely restricted by the arid nature of the local climate and no areas of cultivation are evident. As such, the natural vegetation has been retained across much of the study area and livestock rearing (sheep) is the dominant activity (**Figure 18**).

The nature of the climate and the corresponding land use has resulted in low densities of livestock and relatively large farm properties across the area. Thus rural settlement is sparse, with relatively few scattered farmsteads occurring across the area. Built form in much of the study area is limited to isolated farmsteads, including farm worker's dwellings and ancillary farm buildings, gravel access roads, telephone lines, fences and windmills (**Figure 19** and **Figure 20**).

Further human influence is visible in the area in the form of the N14 national route which traverses the study area in a north-east to south-west direction. In addition, there are numerous small patches of land scattered across the study area which are classified as 'Mines / Quarries'. These areas appear to be small quarries or 'diggings' and are mostly located adjacent to the public roads, especially along the N14 (**Figure 21**).

Built form and human influence on the landscape become more evident in the north-western sector of the study area where several high voltage power lines feed into the Paulputs substation, including the 220kV Aggeneis-Paulputs line and the 132kV Paulputs-Schuitdrift line which runs north-east from Paulputs substation (**Figure 22** and **Figure 23**). The tall steel structures of the substation, as well as the high voltage power line towers are highly visible from various parts of the study area.

Directly adjacent to Paulputs substation are the recently constructed 100MW KaXu Solar One Concentrated Solar Power Plant (CSP) (**Figure 24**), !Xina Solar One CSP and the 10MW Konkoonsies II SEF (**Figure 25**). These developments include large solar fields, associated infrastructure and power lines connecting to Paulputs substation. These developments are substantial anthropogenic features with a distinctly industrial character, resulting in a significant degree of transformation in the landscape. In addition, it was noted during the field investigation that additional construction work, thought to be related to the proposed Konkoonsies SEF is underway adjacent to the Konkoonsies II SEF. This would suggest that further transformation of the landscape is taking place.

The closest built-up area is the town of Pofadder which is situated approximately 50km south-west of the WEF application site while Kakamas is some 75km to the north-east. These small towns are well outside the study area and are thus not expected to have an impact on the visual character of the study area.

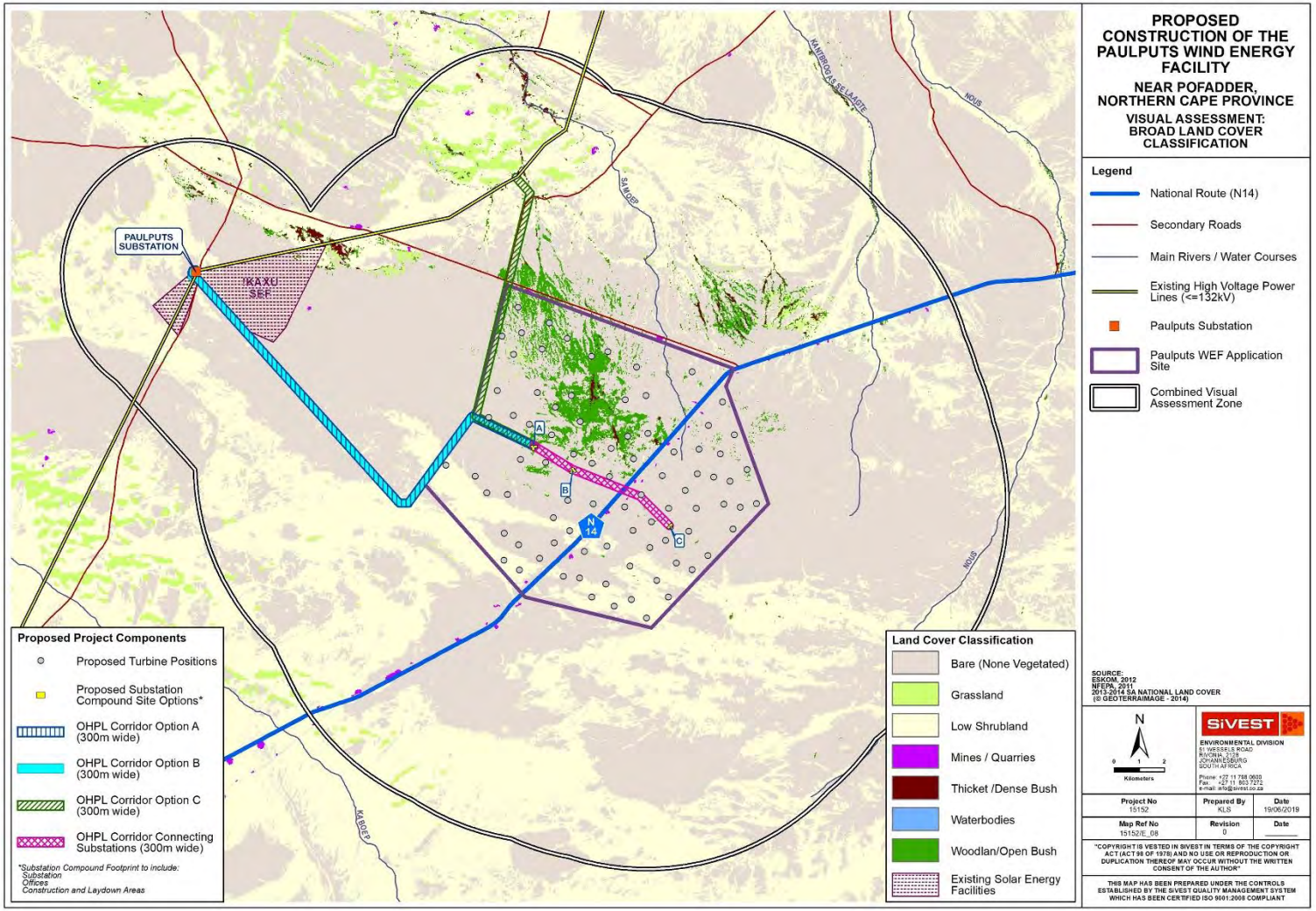


Figure 17: Land Cover Classification

Figure 18: Sheep farm to the south-west of the WEF application site

Figure 19: Typical view of built form in the study area, including farmhouse and associated buildings, power lines and fences.

Figure 20: Typical man-made features in the landscape including a windmill, telephone lines, fences and gravel access road.

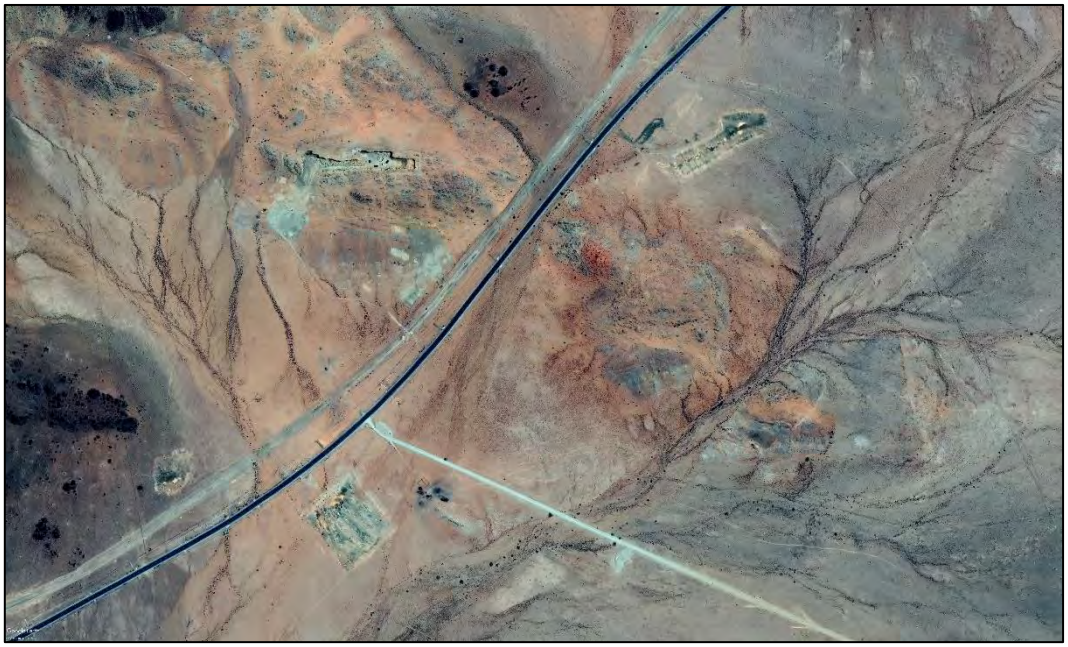


Figure 21: Google earth view of quarry sites adjacent to N14, south-west of the WEF application site.

Figure 22: View of power lines connecting to Paulputs substation.

Figure 23: Paulputs substation

Figure 24: View of KaXu Solar One SEF from the secondary road some 2kms to the north-east.

Figure 25: View of Konkoonsies II SEF from the secondary road some 1.3kms to the west.

Visual Implications

As stated above, the sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral rural elements resulting from sheep rearing activities. In addition, there are no towns or settlements in the study area and thus, there are very low levels of human transformation and visual degradation across much of the study area.

Significant elements of human transformation are however present in the north-western sector of the study area, including existing high voltage power lines, Paulputs substation and the KaXu, Xina and Konkoonsies SEFs. These elements are considered to have degraded the visual character to some degree.

The influence of the level of human transformation on the visual character of the area is described in more detail below.

3.2 Visual Character and Cultural Value

The above physical and land use-related characteristics of the study area contribute to its overall visual character. Visual character largely depends on the level of change or transformation from a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural undisturbed landscape. Visual character is also influenced by the presence of built infrastructure such as buildings, roads and other objects such as telephone or electrical infrastructure.

As mentioned above, much of the study area is characterised by natural landscapes with some pastoral and low densities of human settlement. Livestock grazing is the dominant land use. These activities have not transformed the natural landscape to any significant degree and as such a large portion of the study area has retained its natural character and is dominated by largely natural views.

There are no towns or built-up areas in the study area influencing the overall visual character and thus there are very low levels of human transformation and visual degradation across much of the study area. There are however some significant anthropogenic elements in the study area, including an electrical substation (Paulputs), associated high voltage power lines and the KaXu, !Xina and Konkoonsies SEFs with their associated infrastructure. Other, less prominent elements present in the area include telephone poles, windmills, gravel access roads and farm boundary fences. The presence of this infrastructure is an important factor in this context, as the introduction of the proposed WEF would result in less visual contrast where other anthropogenic elements are already present, especially where the scale of those elements is similar to that of the proposed development.

The presence of the KaXu, !Xina and Konkoonsies SEFs is a significant factor in the visual character of the study area. These types of facilities and their associated infrastructure are typically more industrial in character, significantly altering the visual character and baseline in the study area.

The greater area surrounding the development site is an important factor when assessing visual character. The area can be considered to be typical of a Karoo or “platteland” landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa. Much of South Africa’s dry Karoo interior consists of wide open, uninhabited spaces sparsely punctuated by widely scattered farmsteads and small towns. Traditionally the Karoo has been seen by many as a dull, lifeless part of the country that was to be crossed as quickly as possible on route between the major inland centres and the Cape coast, or between the Cape and Namibia. However, in the last couple of decades this perception has been changing, with the launching of tourism routes within the Karoo region. In a context of increasing urbanisation in South Africa’s major centres, the Karoo is being marketed as an undisturbed getaway, especially as a stop on a longer journey from the northern parts of South Africa to the

Western and Eastern Cape coasts. Examples of this may be found in the “Getaway Guide to Karoo, Namaqualand and Kalahari” (Moseley and Naude-Moseley, 2008).

The typical Karoo landscape can also be considered a valuable ‘cultural landscape’ in the South African context. Although the cultural landscape concept is relatively new, it is becoming an increasingly important concept in terms of the preservation and management of rural and urban settings across the world (Breedlove, 2002).

Cultural Landscapes can fall into three categories (according to the Committee's Operational Guidelines):

- "a landscape designed and created intentionally by man";
- an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape"; and
- an "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element".

The typical Karoo landscape consisting of wide open plains, and isolated relief, interspersed with isolated farmsteads, windmills and stock holding pens, is an important part of the cultural matrix of the South African environment. The Karoo farmstead is also a representation of how the harsh arid nature of the environment in this part of the country has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction. The presence of small towns, such as Pofadder, engulfed by an otherwise rural, almost barren environment, form an integral part of the wider Karoo landscape. As such, the Karoo landscape as it exists today has value as a cultural landscape in the South African context. In terms of the types of cultural landscape listed above, the Karoo cultural landscape would fall into the second category, that of an organically evolved, “continuing” landscape.

In light of this, it is important to assess whether the introduction of a WEF with associated grid connection infrastructure into the study area would be a degrading factor in the context of the natural Karoo character of the landscape. However, considering the fact that a number of WEFs and SEFs have been developed or are likely to be developed across the Karoo, it is possible that renewable energy facilities and wind turbines may in the future become an integral part of the typical Karoo cultural landscape.

In this instance visual impacts on the cultural landscape would be reduced by the fact that the area is relatively remote and there are very few tourism or nature-based facilities in the study area. In addition, although the proposed development will be visible from the N14 national route, the section of this route that traverses the study area does not form part of a designated tourism route.

3.3 Visual Sensitivity

Visual sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area

(i.e. topography, landform and land cover), the spatial distribution of potential receptors, and the likely value judgements of these receptors towards a new development (Oberholzer: 2005). A viewer's perception is usually based on the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational tourism) which may be based on this aesthetic appeal.

In order to assess the visual sensitivity of the area, SiVEST has developed a matrix based on the characteristics of the receiving environment which, according to the Guidelines for Involving Visual and Aesthetic Specialists in the EIA Processes, indicate that visibility and aesthetics are likely to be 'key issues' (Oberholzer: 2005).

Based on the criteria in the matrix (**Table 1**), the visual sensitivity of the area is broken up into a number of categories, as described below:

i) **High** - The introduction of a new development such as a WEF would be likely to be perceived negatively by receptors in this area; it would be considered to be a visual intrusion and may elicit opposition from these receptors.

ii) **Moderate** – Receptors are present, but due to the nature of the existing visual character of the area and likely value judgements of receptors, there would be limited negative perception towards the new development as a source of visual impact.

iii) **Low** - The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

The table below outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

Table 1: Environmental factors used to define visual sensitivity of the study area

FACTORS	**RATING**									
	1	2	3	4	5	6	7	8	9	10
Pristine / natural character of the environment										
Presence of sensitive visual receptors										
Aesthetic sense of place / scenic visual character										
Value to individuals / society										
Irreplaceability / uniqueness / scarcity value										
Cultural or symbolic meaning										
Scenic resources present in the study area										
Protected / conservation areas in the study area										
Sites of special interest present in the study area										
Economic dependency on scenic quality										
Local jobs created by scenic quality of the area										
International status of the environment										
Provincial / regional status of the environment										
Local status of the environment										
**Scenic quality under threat / at risk of change										

**Any rating above '5' for this specific aspect will trigger the need to undertake an assessment of cumulative visual impacts.

Low					Moderate									High
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Based on the above factors, the study area is rated as having a low to moderate visual sensitivity, mainly due to the natural character of the area. It should be stressed however that the concept of visual sensitivity has been utilised indicatively to provide a broad-scale indication of whether the landscape is likely to be sensitive to visual impacts, and is based on the physical characteristics of the study area, economic activities and land use that predominates. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs.

No formal protected areas, leisure-based tourism activities or sensitive receptor locations were identified in the study area and relatively few potentially sensitive receptors were found to be present.

3.4 Visual Absorption Capacity

Visual absorption capacity is the ability of the landscape to absorb a new development without any significant change in the visual character and quality of the landscape. The level of absorption capacity is largely based on the physical characteristics of the landscape (topography and vegetation cover) and the level of transformation present in the landscape.

The relatively flat topography in the study area and the lack of vegetation to provide screening would reduce the visual absorption capacity across much of the area. This would be offset to some degree where the landscape has already undergone significant transformation as a result of the KaXu, !Xina and Konkoonies SEF developments in conjunction with the Paulputs substation and associated 132kV power lines, thus increasing the overall visual absorption capacity of the landscape.

Visual absorption capacity in the study area is therefore rated as moderate.

3.5 Visually Sensitive Areas on the Site

Prior to the preparation of this report, all project specialists were requested to conduct a desktop screening exercise to identify environmentally sensitive areas within the application site. The aim of this exercise was to demarcate those areas of the application site which should be precluded from the WEF development footprint. From a visual perspective, these would be areas where the establishment of wind turbines or other associated infrastructure would result in the greatest probability of visual impacts on potentially sensitive visual receptors.

A visibility analysis, based on a worst case scenario in which the wind turbines would have a maximum height of 230m (at blade tip), showed that the site would be visible from all identified potentially sensitive receptors and as such, no areas on the site were significantly more sensitive than the remainder of the site. The main concern from a visual perspective is therefore the direct visual impact of the turbines on any farmsteads or receptors located on the application site. Accordingly, visual sensitivity is restricted to a 500m exclusion zone on either side of the N14 receptor road and also around the two receptor locations which lie within 500m of the site boundary (**Figure 26**). The preclusion of turbine development from this zone would reduce the direct impact of the turbines on the occupants of the farmstead, especially those impacts related to shadow flicker. For more details regarding this impact refer to **Section 4.1.1** below.

These areas of visual sensitivity have been taken into account in the preliminary turbine layout as shown in **Figure 26** and although several turbines (T4, T5, T9, T14, T52, T63 and T71) are very close to the 500m buffer on the N14, none of these turbines are actually inside the demarcated exclusion zone.

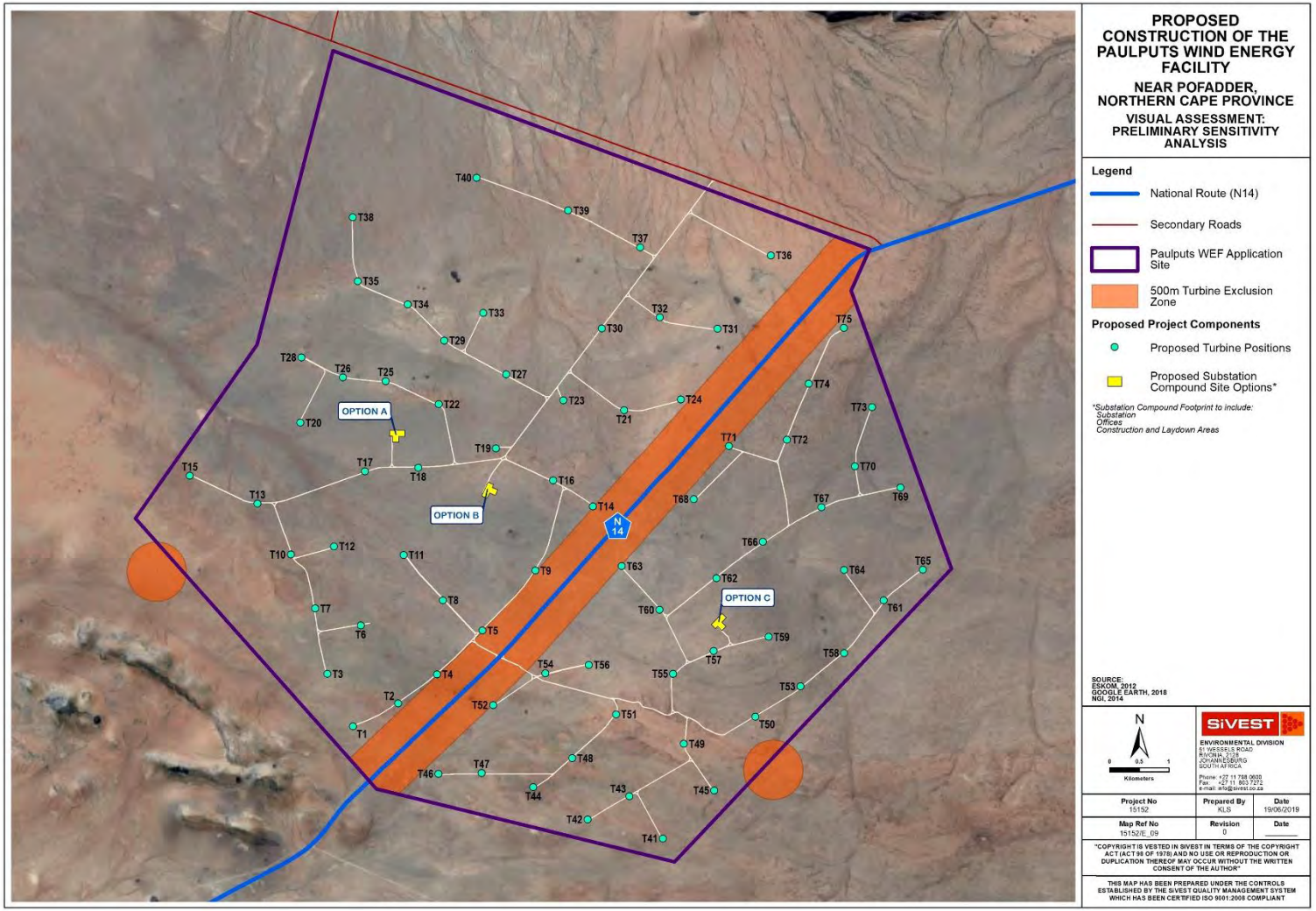


Figure 26: Preliminary visual sensitivity analysis

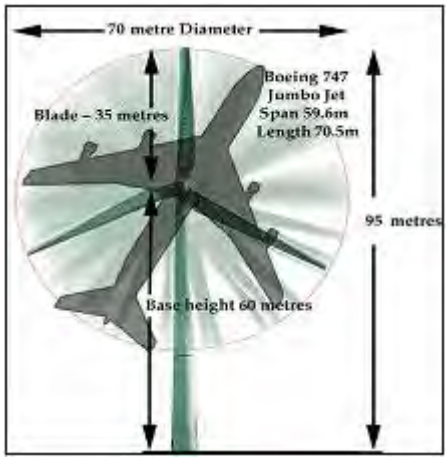
4 GENERIC VISUAL IMPACTS ASSOCIATED WITH THE WIND FARM

In this section, the typical visual issues related to the establishment of a WEF are discussed. It is important to note that the renewable energy industry is still relatively new in South Africa and as such this report draws on international literature and web material (of which there is significant material available) to describe the generic impacts associated with wind energy facilities.

4.1 Wind Energy Facilities

As previously mentioned, at this stage it is anticipated that the proposed project will consist of up to 75 wind turbines and associated infrastructure with a total generation capacity of up to approximately 300MW. The wind turbines will have a hub height of up to 140m and a rotor diameter of up to 180m with a maximum height of 230m at blade tip (approximate in height to a 76 storey building). The height of the turbines and the fact that a WEF comprises a number of turbines distributed across the site would result in the development typically being visible over a large area.

Internationally, studies have demonstrated that there is a direct correlation between the number of turbines and the degree of objection to a wind farm, with less opposition being encountered when fewer turbines are proposed (Devine-Wright, 2005). Certain objectors to wind farms raise concerns about the “sky space” occupied by the rotors of a turbine. “Sky space” refers to the area in which the rotors would rotate. The diagram below which relates to a turbine with a rotor diameter of only 70m, indicates that the “sky space” occupied by these rotors would be similar to that occupied by a jumbo jet[1].



[1] http://stopbickertonwindturbines.co.za

The visual prominence of the development would be exacerbated within natural settings, in areas of flat terrain or if located on ridge tops. Given the height of the turbines, even dense stands of wooded vegetation are only likely to offer partial visual screening.

4.1.1 Shadow flicker

Shadow flicker is an effect which is caused when shadows repeatedly pass over the same point. It can be caused by wind turbines when the sun passes behind the hub of a wind turbine and casts a shadow that continually passes over the same point as the blade of the wind turbine rotates (http://www.ecotricity.co.uk).

The effect of shadow flicker is only likely to be experienced by people situated directly within the shadow cast by the blade of the wind turbine. As such, shadow flicker is only expected to have an impact on and cause health risks to people residing in houses located within close proximity of a wind turbine (less than 500m) and at a specific orientation, particularly in areas where there is little screening present. Shadow flicker may also be experienced by motorists if a wind turbine is located in close proximity to an existing road. The impact of shadow flicker can be effectively mitigated by choosing the correct site and layout for the wind turbines, taking into consideration the orientation of the turbines relative to the nearby houses and also the latitude of the site. Tall structures and trees will also obstruct shadows and prevent the effect of shadow flicker from impacting on surrounding residents (http://www.ecotricity.co.uk).

4.1.2 Motion-based visual intrusion

An important component of the visual impacts associated with wind turbines is the *movement* of the rotors. Labelled as motion-based visual intrusion, this refers to the inclination of the viewer to focus on discordant, moving features when scanning the landscape. Evidence from surveys of public attitudes towards wind farms suggest that the viewing of moving blades is not necessarily perceived negatively (Bishop and Miller, 2006). The authors of the study suggest two possible reasons for this; firstly, when the turbines are moving they are seen as being ‘at work’, ‘doing good’ and producing energy. Conversely, when they are stationary they are regarded as a visual intrusion that has no evident purpose. More interestingly, the second theory that explains this perception is related to the intrinsic value of wind in certain areas and how turbines may be an expression or extension of an otherwise ‘invisible’ presence.

Famous winds across the world include the Mistral of the Camargue in France, the Föhn in the Alps, or the Bise in the Lavaux region of Switzerland. The wind, in these cases, is an intrinsic component of the landscape, being expressed in the shape of trees or drifts of sands, but being otherwise invisible. Bishop and Miller (2006) argue that wind turbines in these environments give expression, when moving, to this quintessential landscape element. In a South African context, this phenomenon may well be experienced if wind farms are developed in areas where typical winds, like berg winds, or the south-easter in the Cape are an intrinsic part of the environment. In this way, it may even be possible that wind farms will, through time form part

of the cultural landscape of an area, and become a representation of the opportunities presented by the natural environment.

4.1.3 Wind Farm Electrical Infrastructure

Electrical infrastructure will include:

- A new on-site 132kV substation.
- Medium voltage cabling connecting the turbines to the on-site substation.
- A 132kV overhead power line from the on-site substation either to the Paulputs substation or to the existing 132kV power lines which traverse the area.

Power line towers and substations are by their nature very large objects and thus highly visible. According to the project description provided by Arcus, the maximum tower height envisaged for the proposed power line is 30m (equivalent in height to a ten storey building). Although a pylon/tower structure would be less visible than a building, the height of the structure means that the pylon would still typically be visible from a considerable distance. Visibility would be increased by the fact that the power line comprises a series of towers typically spaced approximately 200m to 400m apart in a linear alignment.

As described above, power lines and substations are not features of the natural environment, but are representative of human (anthropogenic) alteration of the natural environment. Thus, elements of grid connection infrastructure could be perceived to be highly incongruous in the context of a largely natural landscape. The height and linear nature of the power line will exacerbate this incongruity, as the towers may impinge on views within the landscape. In addition, the practice of clearing taller vegetation from areas within the power line servitude can increase the visibility and incongruity of the power line. In a largely natural, bushy setting, vegetation clearance will cause fragmentation of the natural vegetation cover, thus making the power line more visible and drawing the viewer's attention to the servitude.

In this instance, the proposed grid connection infrastructure is intended to serve the proposed Paulputs WEF and as such, will only be built if the WEF project goes ahead. The power line and substation infrastructure are therefore likely to be perceived as part of the greater WEF development and the visual impact will be relatively minor when compared to the visual impact associated with WEF as a whole.

4.1.4 Other WEF Infrastructure

The other infrastructure associated with the proposed Paulputs WEF will include the following:

- Internal roads between 6m and 12m;
- Hardstand areas at the base of each turbine to accommodate the turbine base and crane pad.
- A permanent laydown area and a temporary construction laydown.

- Operations and maintenance (O&M) buildings
- Security lighting.

Surface clearance for access roads, hardstand areas and laydown areas may result in the increased visual prominence of these features, thus increasing the level of contrast with the surrounding landscape. Buildings placed in prominent positions such as on ridge tops may also break the natural skyline, drawing the attention of the viewer. In addition, security lighting on the site may impact on the nightscape (**Section 5.4**).

The visual impact of infrastructure associated with a WEF is generally not regarded as a significant factor when compared to the visual impact associated with wind turbines. The infrastructure would however increase the visual "clutter" of the WEF and magnify the visual prominence of the development if located on ridge tops or flat sites in natural settings where there is limited tall wooded vegetation to conceal the impact.

5 SENSITIVE VISUAL RECEPTORS

A sensitive visual receptor location is defined as a location from where receptors would potentially be impacted by a proposed development. Adverse impacts often arise where a new development is seen as an intrusion which alters the visual character of the area and affects the 'sense of place'. The degree of visual impact experienced will however vary from one receptor to another, as it is largely based on the viewer's perception.

A distinction must be made between a receptor location and a sensitive receptor location. A receptor location is a site from where the proposed development may be visible, but the receptor may not necessarily be adversely affected by any visual intrusion associated with the development. Less sensitive receptor locations include locations of commercial activities and certain movement corridors, such as roads that are not tourism routes. More sensitive receptor locations typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include tourism facilities, scenic sites and residential dwellings in natural settings.

The identification of sensitive receptors is typically based on a number of factors which include:

- the visual character of the area, especially taking into account visually scenic areas and areas of visual sensitivity;
- the presence of leisure-based (especially nature-based) tourism in an area;
- the presence of sites or routes that are valued for their scenic quality and sense of place;
- the presence of homesteads / farmsteads in a largely natural setting where the development may influence the typical character of their views; and
- feedback from interested and affected parties, as raised during the public participation process conducted as part of the EIA study.

As the visibility of the development would diminish exponentially over distance (refer to **section 2.4** above), receptor locations which are closer to the WEF or power line corridor would experience greater adverse visual impact than those located further away. Zones of visual impact for the WEF and the grid connection infrastructure were therefore delineated based on distance bands measured from the proposed turbine locations and the power line corridors.

The degree of visual impact experienced will however vary from one inhabitant to another, as it is largely based on the viewer's perception. Factors influencing the degree of visual impact experienced by the viewer include the following:

- Value placed by the viewer on the natural scenic characteristics of the area.
- The viewer's sentiments toward the proposed structures. These may be positive (a symbol of progression toward a less polluted future) or negative (foreign objects degrading the natural landscape).
- Degree to which the viewer will accept a change in the typical Karoo character of the surrounding area.

5.1 Receptors: WEF

Based on the height and scale of the WEF project, the distance intervals chosen for the zones of visual impact are as follows:

- 0 - 2km (high impact zone)
- 2 - 6km (moderate impact zone)
- 6 - 10km (low impact zone)

Preliminary desktop assessment of the study area during the scoping phase of the project identified 26 potentially sensitive visual receptor locations, all of which appear to be existing farmsteads or farmhouses. These dwellings are regarded as potentially sensitive visual receptors as they are located within a mostly rural setting and the proposed development will likely alter natural vistas experienced from these locations, although sentiments toward the proposed development are unknown.

Based on the findings of the field assessment conducted in November 2018, seven (7) of the identified locations were removed from the list of potentially sensitive receptors. Some of these seven (7) locations were outside the 10km assessment zone for the WEF, while others were identified as structures not considered to be visual receptors. None of the identified receptor locations was considered to be a sensitive receptor and no leisure or nature-based activities were identified in the study area. This receptor database was further refined for the EIA-level assessment to include only those receptors within 10kms of a turbine placement in the amended WEF layout, thus reducing the number of receptors to sixteen (16).

In many cases, roads along which people travel, are regarded as sensitive receptors. The primary thoroughfare in the study area is the N14 national route. The N14 is the primary access road into Kakamas to the north-east and Pofadder to the south-west, and carries much of the

local access traffic to and from these towns. In addition, this route connects Johannesburg/Gauteng with Springbok in the Northern Cape and a section of the route (between Upington and Kakamas) forms part of a tourism route known as the Kokerboom Food & Wine Route. The Kokerboom Food & Wine Route takes tourists and travelers into one of the most interesting and beautiful areas of South Africa's Northern Cape Province and embraces the towns and settlements of Keimoes, Kanoneiland, Kenhardt, Augrabies, Upington and Marchand (http://www.openafrica.org/experiences/route/58-kokerboom-food-and-wine-route). In addition, the N14 provides access to the Namaqua Coastal Route (to the west of Springbok) and to the Richtersveld National Park and the Namibian border (to the north of Springbok).

The section of the N14 traversing the study area does not however form part of a designated tourism route, although it is likely that the road is utilised, to some extent, for its tourism potential. As a result, the N14 is considered to be a potentially sensitive receptor road – i.e. a road being used by motorists who may object to the potential visual intrusion of the proposed WEF.

It is believed that the secondary road running adjacent to the northern boundary of the WEF application site could be used as an alternative access to tourist facilities along the Orange River some 35kms to the north-west. This road is not however considered to be a potentially sensitive receptor road as it is more likely that tourists would use the R358 provincial main road for this purpose.

Other thoroughfares in the study area are primarily used as local access roads and do not form part of any scenic tourist routes. These roads are not specifically valued or utilised for their scenic or tourism potential and are therefore not regarded as visually sensitive.

The potentially sensitive visual receptor locations in relation to the zones of visual impact for the proposed WEF are indicated in **Figure 27** below.

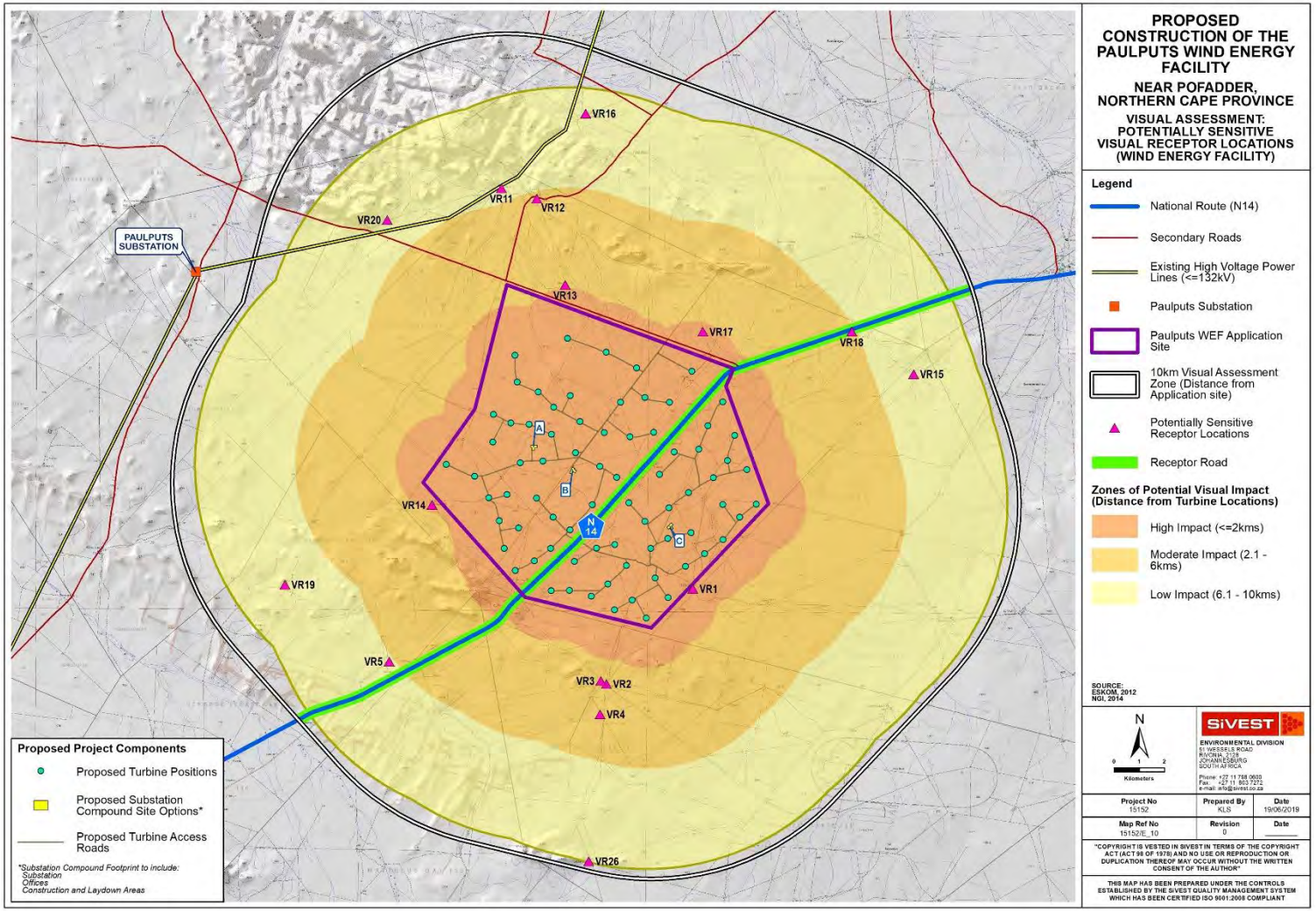


Figure 27: Potentially sensitive visual receptors within 10kms of the WEF

5.2 Receptors: Grid Connection Infrastructure

Given the length of the proposed power line and the likely height of the associated towers, the radii chosen for the zones of visual impact are as follows:

- <=500m (high impact zone)
- 500m < 2km (moderate impact zone)
- 2km < 5km (low impact zone)

With the addition of a fourth grid connection corridor option, running northwards from the WEF, the visual assessment zone for the grid connection infrastructure has extended significantly for this phase of the project. As a result, receptors identified in the extended assessment area have been included in this EIA-phase report. A total number of eleven (11) receptors have been identified within 5kms of the power line corridor options. As with the WEF receptors, these receptors appear to be existing farmsteads or farmhouses, but as they are located within a mostly rural setting, they are regarded as potentially sensitive visual receptors.

As stated above, the N14 national route is considered to be a potentially sensitive receptor as motorists travelling along this road could be visually exposed to the proposed 132kV power line and substation.

The potentially sensitive visual receptor locations in relation to the zones of visual impact for the proposed grid connection infrastructure are indicated in **Figure 28**.

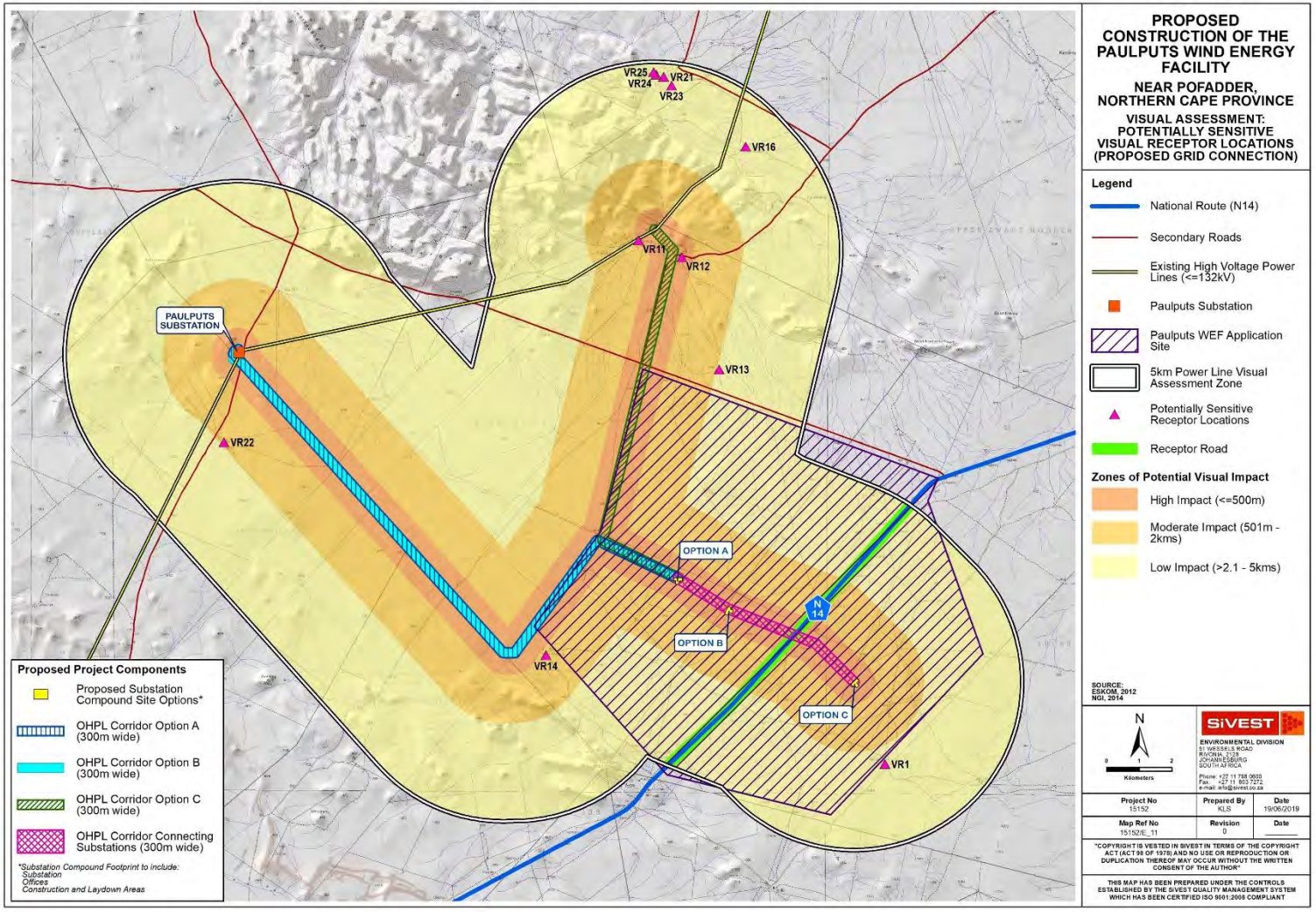


Figure 28: Potentially sensitive receptors within 5kms of the power line assessment corridors

5.3 Receptor Impact Rating

In order to assess the impact of the proposed development on the identified potentially sensitive receptor locations, a matrix that takes into account a number of factors has been developed and is applied to each receptor location.

The matrix is based on a number of factors as listed below:

- Distance of a receptor location from the proposed development (zones of visual impact)
- Presence of screening elements (topography, vegetation etc.)
- Visual contrast of the development with the landscape pattern and form

These factors are considered to be the most important factors when assessing the visual impact of a proposed development on a potentially sensitive receptor location in this context. It should be noted that this rating matrix is a relatively simplified way of assigning a likely representative visual impact, which allows a number of factors to be considered. Experiencing visual impacts is however a complex and qualitative phenomenon, and is thus difficult to quantify accurately. The matrix should therefore be seen as a representation of the likely visual impact at a receptor location. Part of its limitation lies in the quantitative assessment of what is largely a qualitative or subjective impact.

As described above, distance of the viewer / receptor location from the development is an important factor in the context of experiencing visual impacts which will have a strong bearing on mitigating the potential visual impact. A high impact rating has been assigned to receptor locations that are located within 2km of the proposed WEF development and within 500m of the nearest power line assessment corridor. Beyond 10km, the visual impact of a WEF diminishes considerably, as the development would appear to merge with the elements on the horizon.

The presence of screening elements is an equally important factor in this context. Screening elements can be vegetation, buildings and topographic features. For example, a grove of trees or a series of low hills located between a receptor location and an object could completely shield the object from the receptor. As such, where views of the proposed development are completely screened, the receptor has been assigned an overriding negligible impact rating, as the development would not impose any impact on the receptor.

The visual contrast of a development refers to the degree to which the development would be congruent with the surrounding environment. This is based on whether or not the development would conform to the land use, settlement density, structural scale, form and pattern of natural elements that define the structure of the surrounding landscape. The visual compatibility is an important factor to be considered when assessing the impact of the development on receptors within a specific context. A development that is incongruent with the surrounding area could have a significant visual impact on sensitive receptors as it may change the visual character of the landscape.

In order to determine the likely visual compatibility of the proposed development, the study area was classified into the following zones of visual contrast:

- **High –** undeveloped / natural / rural areas.
- **Moderate -** areas within 500m of any existing power line in undeveloped / natural / rural area, and also areas between 1 and 2kms from the KaXu, !Xina and Konkoonsies SEFs.
- **Low –** areas within 500m of Paulputs substation, and areas within 1km of KaXu, !Xina and Konkoonsies SEFs.

These zones are depicted in **Figure 29** below.

The matrix returns a score which in turn determines the visual impact rating assigned to each receptor location (**Table 2**) below.

Table 2: Rating scores

Rating	Overall Score
High Visual Impact	8-9
Moderate Visual Impact	5-7
Low Visual Impact	3-4
Negligible Visual Impact	(overriding factor)

An explanation of the matrix is provided in **Table 3** below.

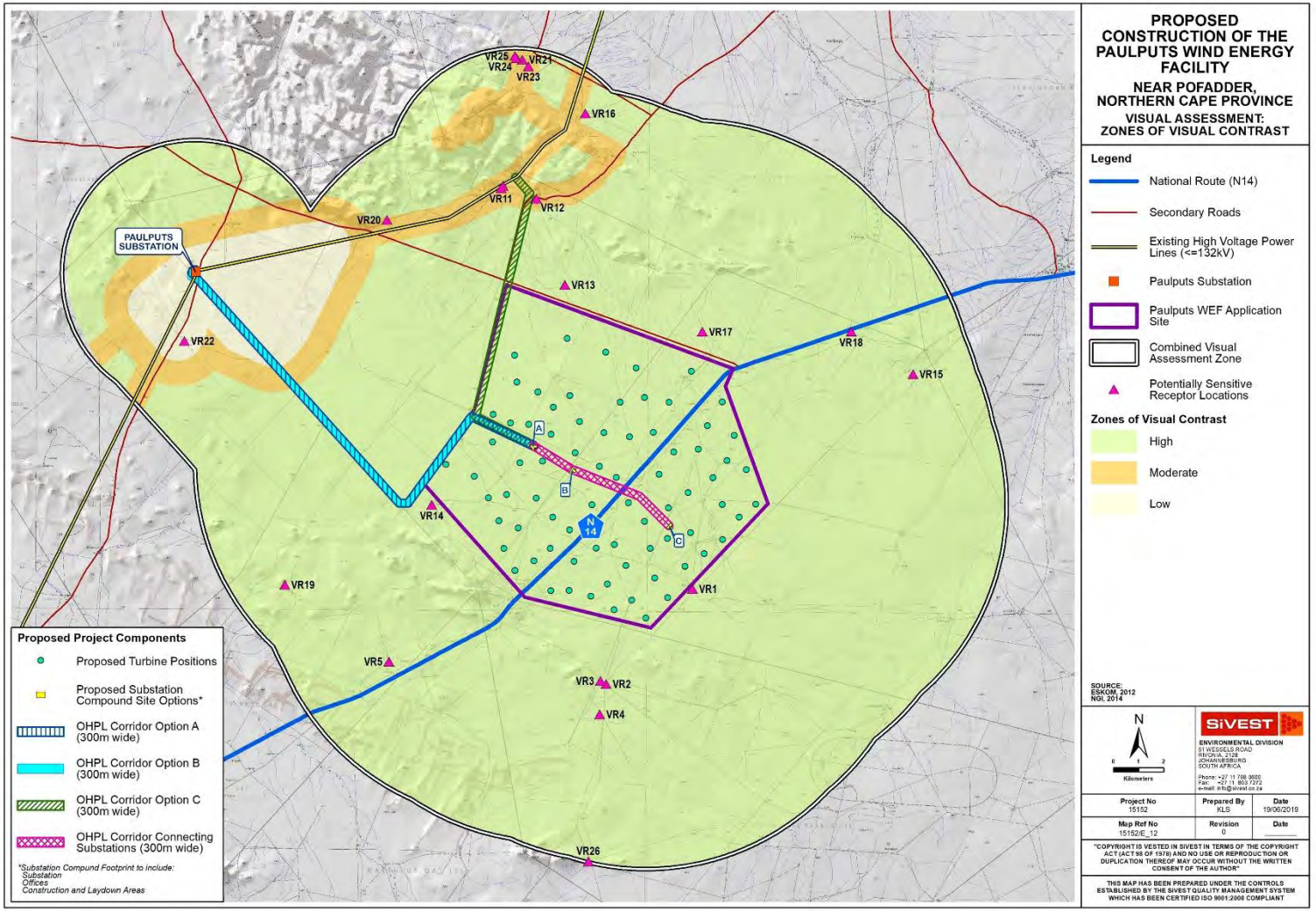


Figure 29: Zones of Visual Contrast

Table 3: Visual assessment matrix used to rate the impact of the proposed development on potentially sensitive receptors

	VISUAL IMPACT RATING			
VISUAL FACTOR	**HIGH**	**MODERATE**	**LOW**	**OVERRIDING FACTOR: NEGLIGIBLE**
Distance of receptor away from proposed development	WEF: <= 2km Grid: <= 500m **Score 3**	WEF: 2 < 6km Grid: 500m < 2km **Score 2**	WEF: 6km < 10km Grid: 2km < 5km **Score 1**	WEF: >10km Grid: >5km
Presence of screening factors	No / almost no screening factors – development highly visible **Score 3**	Screening factors partially obscure the development **Score 2**	Screening factors obscure most of the development **Score 1**	Screening factors completely block any views towards the development, i.e. the development is not within the viewshed
Visual Contrast	**High contrast** with the pattern and form of the natural landscape elements (vegetation and land form), typical land use and/or human elements (infrastructural form) **Score 3**	**Moderate contrast** with the pattern and form of the natural landscape elements (vegetation and land form), typical land use and/or human elements (infrastructural form) **Score 2**	**Corresponds** with the pattern and form of the natural landscape elements (vegetation and land form), typical land use and/or human elements (infrastructural form) **Score 1**	

Table 4 below presents a summary of the overall visual impact of the proposed development on each of the potentially sensitive visual receptor locations identified within the study area. As previously mentioned, due to access limitations, the identified potentially sensitive visual receptor locations were not fully investigated from a visual perspective during the time of the field investigation. Notwithstanding this limitation, these receptor locations were still regarded as being potentially sensitive to the visual impacts associated with the proposed development and were assessed as part of the VIA, via desktop means where required.

Table 4: Potentially sensitive visual receptor impact rating

WIND ENERGY FACILITY					
Receptor Number	**Distance to nearest wind turbine**		**Screening**	**Contrast**	**OVERALL IMPACT RATING**
VR 1 - Farmstead	High (3)	941m	Mod (2)	High (3)	**HIGH (8)**
VR 2 - Farmstead	Mod (2)	2.9km	Mod (2)	High (3)	**MODERATE (7)**
VR 3 - Farmstead	Mod (2)	2.8km	Mod (2)	High (3))	**MODERATE (7)**
VR 4 - Farmstead	Mod (2)	4.2km	Mod (2)	High (3)	**MODERATE (7)**
VR 5 - Farmstead	Low (1)	6.2km	Mod (2)	High (3)	**MODERATE (6)**
VR 11 - Farmstead	Low (1)	6.5km	Mod (2)	Mod (2)	**MODERATE (5)**
VR 12 - Farmstead	Mod (2)	5.7km	Mod (2)	Mod (2)	**MODERATE (6)**
VR 13 - Farmstead	Mod (2)	2.1km	Mod (2)	High (3)	**MODERATE (7)**
VR 14 - Farmstead	High (3)	1.7km	Mod (2)	High (3)	**HIGH (8)**
VR 15 - Farmstead	Low (1)	7.5km	Mod (2)	High (3)	**MODERATE (6)**
VR 16 - Farmstead	Low (1)	8.9km	Mod (2)	High (3)	**MODERATE (6)**
VR 17 - Farmstead	High (3)	1.6km	Mod (2)	High (3)	**HIGH (8)**
VR 18 - Farmstead	Mod (2)	5.8km	Mod (2)	High (3)	**MODERATE (7)**
VR 19 - Farmstead	Low (1)	8.0km	Mod (2)	High (3)	**MODERATE (6)**
VR 20 - Farmstead	Low (1)	7.4km	Mod (2)	Mod (2)	**MODERATE (5)**
VR 26 - Farmstead	Low (1)	9.9km	Mod (2)	High (3)	**MODERATE (6)**
GRID CONNECTION INFRASTRUCTURE					
Receptor Number	**Distance to nearest corridor alternative**		**Screening**	**Contrast**	**OVERALL IMPACT RATING**
VR 1 - Farmstead	Low (1)	2.5km	Mod (2)	High (3)	**MODERATE (6)**
VR 11 - Farmstead	High (3)	0.4km	Mod (2)	Mod (2)	**MODERATE (7)**
VR 12 - Farmstead	High (3)	0.2km	Mod (2)	Mod (2)	**MODERATE (7)**
VR 13 - Farmstead	Low (1)	2km	Mod (2)	High (3)	**MODERATE (6)**
VR 14 - Farmstead	Mod (2)	0.7km	Mod (2)	High (3)	**MODERATE (7)**
VR 16 - Farmstead	Low (1)	3.6km	Mod (2)	High (2)	**MODERATE (5)**
VR 21 - Farmstead	Low (1)	4.5km	Mod (2)	Mod (2)	**MODERATE (5)**
VR 22 - Farmstead	Mod (2)	1.9km	Mod (2)	Low (1)	**MODERATE (5)**
VR 23 - Farmstead	Low (1)	4.3km	Mod (2)	Mod (2)	**MODERATE (5)**
VR 24 - Farmstead	Low (1)	4.6km	Mod (2)	Mod (2)	**MODERATE (5)**
VR 25 - Farmstead	Low (1)	4.7km	Mod (2)	Mod (2)	**MODERATE (5)**

The table above shows that three (3) of the potentially sensitive receptors would experience high levels of visual impact as a result of the proposed Paulputs WEF development. All of these receptors are farmsteads located in relatively close proximity to the application site and this factor, in conjunction with the relatively flat terrain in the area, gives rise to a high impact rating. None of these receptors are tourism-related facilities however, and as such they are not considered to be Sensitive Receptors. Thus the high impact rating assigned will not affect the overall impact ratings determined in **Section 5.7**.

The remaining thirteen (13) receptor locations affected by the proposed WEF would be subjected to moderate levels of visual impact as a result of the proposed development.

All eleven (11) receptor locations identified within 5kms of the proposed power line assessment corridors would experience moderate levels of visual impact from the grid connection infrastructure.

As stated above, the N14 national route could be considered as a potentially sensitive receptor road in the study area and elements of the proposed development would be highly visible to motorists travelling along this route. This section of the N14 however does not form part of a designated tourism route and as such, visual impacts affecting the N14 are rated as moderate.

5.4 Night-time Impacts

The visual impact of lighting on the nightscape is largely dependent on the existing lighting present in the surrounding area at night. The night scene in areas where there are numerous light sources will be visually degraded by the existing light pollution and therefore additional light sources are unlikely to have a significant impact on the nightscape. In contrast, introducing new light sources into a relatively dark night sky will impact on the visual quality of the area at night. It is thus important to identify a night-time visual baseline before exploring the potential visual impact of the proposed wind farm at night.

Much of the study area is characterised by natural areas with pastoral elements and low densities of human settlement and as a result, relatively few light sources are present in the broader area surrounding the proposed development site. The closest built-up area is the town of Pofadder which is situated approximately 50km south-west of the application site and is thus too far away to have significant impacts on the night scene. Thus the general study area is characterised by a picturesque dark starry sky at night and the visual character of the night environment across the broader area is largely 'unpolluted' and pristine. Sources of light in the area are largely limited to isolated lighting from surrounding farmsteads and transient light from the passing cars travelling along the N14 national route. Some light pollution is however likely to emanate from the operational and security lighting at Paulputs substation and the adjacent KaXu, !Xina and Konkoonsies SEFs, thus reducing the impacts of additional lighting in the area.

Given the scale of the proposed WEF, the operational and security lighting required for the proposed project is likely to intrude on the nightscape and create glare, which will contrast with the dark backdrop of the surrounding area. In addition, any red hazard lights placed on top of

the turbines may be particularly noticeable as their colour will differ from the few lights typically found within the environment and the flashing will draw attention to them.

Power lines and associated towers or pylons are not generally lit up at night and, thus light spill associated with the proposed grid connection infrastructure is only likely to emanate from the proposed on-site substation. Lighting from this facility is expected to intrude on the nightscape to some degree. It should however be noted that the grid connection infrastructure will only be constructed if the proposed Paulputs WEF is developed and thus the lighting impacts from the proposed substation would be subsumed by the glare and contrast of the lights associated with the WEF. As such, the grid connection infrastructure is not expected to result in significant lighting impacts.

5.5 Turbine Colour

Bright colours and distinctive logos on the wind turbines could increase the level of contrast with the landscape and exacerbate visual clutter. It is however understood that the Civil Aviation Authority requires that turbines are painted white and this would decrease the level of visual contrast. The painting of one or more rotor blades in a different colour, to accommodate avifaunal protection measures for example, would increase the visual impacts of the turbines to some extent, but this increase is not sufficient to increase the impact ratings. From a visual perspective however, it would be preferred if the colour used for this purpose is restricted to black or grey.

5.6 Cumulative Impacts

Although it is important to assess the visual impacts of the proposed WEF and grid connection infrastructure specifically, it is equally important to assess the cumulative visual impact that could materialise if other renewable energy facilities (both wind and solar facilities) and associated infrastructure projects are developed in the broader area. Cumulative impacts occur where existing or planned developments, in conjunction with the proposed development, result in significant incremental changes in the broader study area. In this instance, such developments would include renewable energy facilities and associated infrastructure development.

Renewable energy facilities have the potential to cause large scale visual impacts and the location of several such developments in close proximity to each other could significantly alter the sense of place and visual character in the broader region. Although power lines and substations are relatively small developments when compared to renewable energy facilities, they may still introduce a more industrial character into the landscape, thus altering the sense of place.

Eleven renewable energy projects were identified a 35 km radius of the proposed Paulputs WEF and grid connection infrastructure. These projects, as listed in **Table 5** below, were identified using the DEA's Renewable Energy EIA Application Database for SA. It is assumed

that all of these renewable energy developments include grid connection infrastructure, although few details of this infrastructure were available at the time of writing this report.

It should be noted that efforts to obtain additional information about these projects have been unsuccessful and as such the assessment of the likely cumulative impacts of these developments has been largely based on some broad assumptions regarding the likely impacts of solar energy developments.

Table 5: Renewable energy developments proposed within a 35km radius of the Paulputs WEF application site.

Development	Current status of EIA/development	Technology	Capacity
KaXu Solar One SEF	In operation	Solar	100MW
Khoi-Sun SEF	EIA approved	Solar	75MW
Konkoonsies II SEF	In operation	Solar	20MW
Konkoonsies SEF	Construction underway	Solar	75MW
Paulputs PV 1 SEF	EIA approved	Solar	100MW
Paulputs PV 2 SEF	EIA approved	Solar	100MW
Paulputs PV 3 SEF	EIA approved	Solar	100MW
Skuitdrift SEF	EIA approved	Solar	10MW
Southern Cross SEF	EIA underway	Solar	20MW
Tutwa SEF	EIA underway	Solar	20MW
!Xina Solar One SEF	In Operation	Solar	100MW

All of these projects are Solar Energy facilities (SEFs) and as such are expected to have different impacts when compared to WEF projects. These renewable energy developments are however relevant as they influence the cumulative visual impact of the proposed development.

Four (4) of the SEFs identified are concentrated some 30kms to the north of the application site, close to the Orange River. These projects are therefore well outside the visual assessment zone for this study and although the introduction of an increasingly industrial character into the broader area is inevitable, it is not anticipated that these developments will result in any significant cumulative impacts affecting the landscape or the visual receptors within the visual assessment zone.

The remaining seven (7) projects are however located within the 10km visual assessment zone for the Paulputs project, and three of these, namely KaXu Solar One SEF, !Xina Solar One SEF and Konkoonsies II SEF are in operation. It is believed that construction on the Konkoonsies SEF has recently commenced. All eleven (11) projects are concentrated in close proximity to Paulputs substation and the surrounding landscape has already undergone noticeable change, which will be exacerbated with the development of a WEF in the area as proposed. Impacts of this transformation will however be reduced by the fact the landscape in the vicinity of the proposed WEF development has already been disturbed by the Paulputs substation and the existing high voltage power lines feeding into it.

It should be noted that two projects (KaXu solar One and !Xina Solar One) are CSPs, while the Konkoonsies projects and the Paulputs PV projects are all Solar Photovoltaic (PV) facilities. The CSPs, which both use parabolic trough technology with a central power plant, are significantly larger, and more prominent facilities than the nearby PV facilities. Although the parabolic troughs can reach a height of 8m, these structures, are considerably less visible than wind turbines and as such the SEF developments would be outside the viewing distance of most of the potentially sensitive receptor locations identified in the study area. Cumulative impacts affecting these receptors would therefore be reduced and the severity of these impacts would depend on the perceptions of the receptors.

Although it was not possible to access the VIAs conducted for these SEFs, it was ascertained from the Environmental Management Plan (EMP) obtained for KaXu SEF, that the VIA identified similar visual impacts to those identified in this report and also provided similar recommendations and mitigation measures. As such, it has been assumed that the visual specialist study for KaXu SEF is in line with this VIA.

From a visual perspective, the further concentration of renewable energy facilities as proposed will inevitably change the visual character of the area and alter the inherent sense of place, introducing an increasingly industrial character into a largely natural area, and thus giving rise to significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures put forward by the visual specialists in their respective reports.

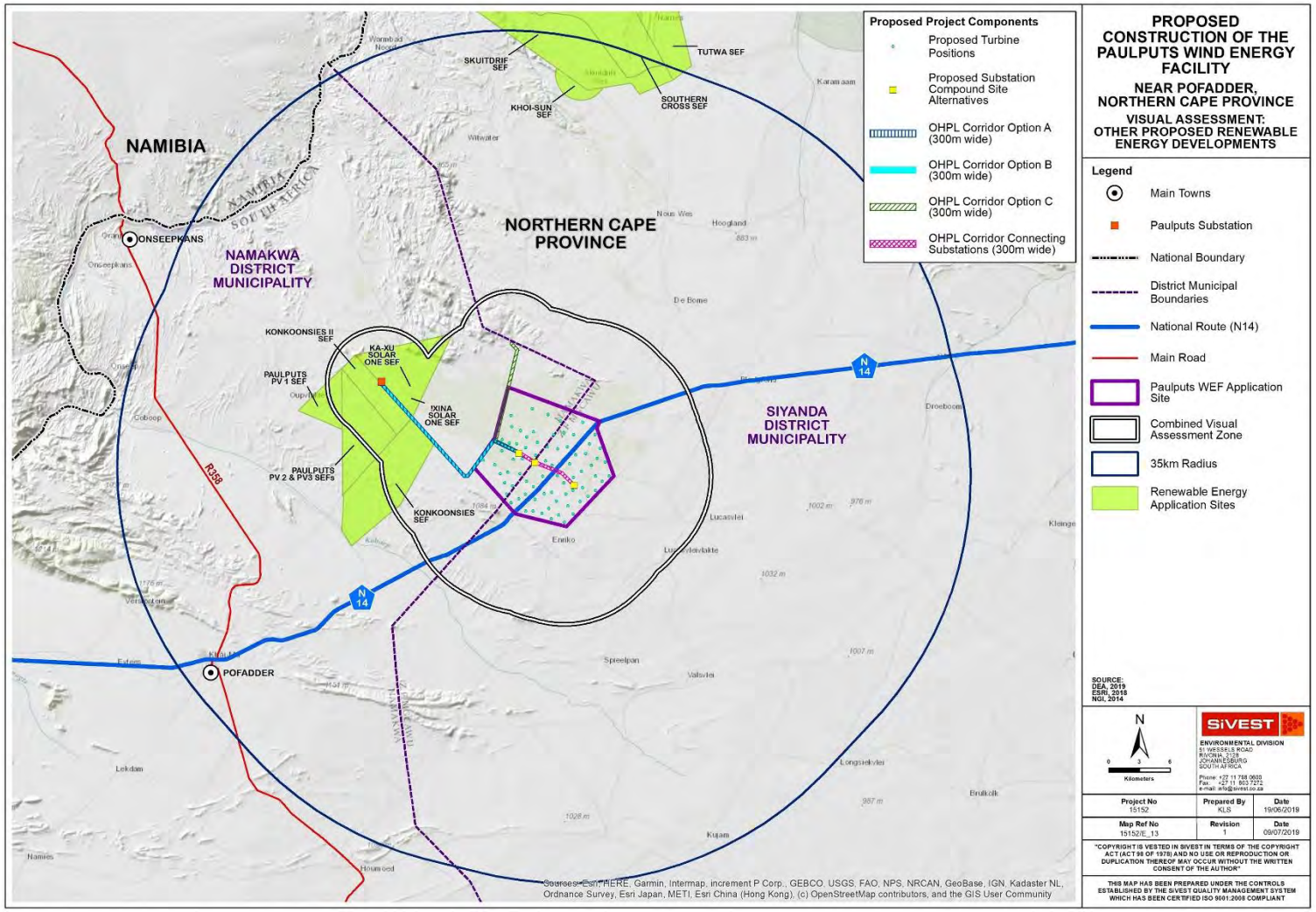


Figure 30: Renewable energy facilities proposed within a 35km radius of the Paulputs WEF application site

5.7 Overall Visual Impact Rating

The EIA Regulations, 2014 (as amended) require that an overall rating for visual impact be provided to allow the visual impact to be assessed alongside other environmental parameters. The tables below present the impact matrix for visual impacts associated with the proposed construction and operation of the proposed Paulputs WEF and the associated grid connection infrastructure. Preliminary mitigation measures have determined based on best practice and literature reviews.

5.7.1 Construction

Table 6: Rating of visual impacts of the proposed Paulputs WEF during construction

Impact Phase: Construction							
Potential impact description: ▪ Large construction vehicles and equipment will alter the natural character of the study area and expose visual receptors to impacts associated with construction. ▪ Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. ▪ Dust emissions and dust plumes from increased traffic on the gravel roads serving the construction site may evoke negative sentiments from surrounding viewers. ▪ Surface disturbance during construction would expose bare soil (scarring) which could visually contrast with the surrounding environment. ▪ Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.							
	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	M	Negative	M	M	M
With Mitigation	M	L	L	Negative	L	M	M
Can the impact be reversed?			YES – the negative effects of construction will cease once construction is complete				
Will impact cause irreplaceable loss or resources?			YES – there will be marginal loss of resources				
Can impact be avoided, managed or mitigated?			YES – mitigation measures can reduce impacts				
Mitigation measures to reduce residual risk or enhance opportunities: ▪ Carefully plan to mimimise the construction period and avoid construction delays. ▪ Inform receptors of the construction programme and schedules. ▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ▪ Vegetation clearing should take place in a phased manner.							

▪ Maintain a neat construction site by removing rubble and waste materials regularly. ▪ Make use of existing gravel access roads where possible. ▪ Limit the number of vehicles and trucks travelling to and from the proposed site, where possible. ▪ Unless there are water shortages, ensure that dust suppression techniques are implemented o on all access roads; o in all areas where vegetation clearing has taken place; o on all soil stockpiles.	
Impact to be addressed/ further investigated and assessed in Impact Assessment Phase?	YES – the amended layout would need to be investigated.

Table 7: Rating of visual impacts of the on-site infrastructure associated with the Paulputs WEF during construction (internal roads, construction laydown areas, O&M buildings and cabling).

Impact Phase: Construction							
Potential impact description: ▪ Large construction vehicles and equipment will alter the natural character of the study area and expose visual receptors to impacts associated with construction. ▪ Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. ▪ Dust emissions and dust plumes from increased traffic on the gravel roads serving the construction site may evoke negative sentiments from surrounding viewers. ▪ Surface disturbance during construction would expose bare soil which could visually contrast with the surrounding environment. ▪ Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust emissions which would have a visual impact.							
	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	M	Negative	M	M	M
With Mitigation	M	L	L	Negative	L	M	M
Can the impact be reversed?			YES – the negative effects of construction will cease once construction is complete				
Will impact cause irreplaceable loss or resources?			YES – there will be marginal loss of resources				
Can impact be avoided, managed or mitigated?			YES – mitigation measures can reduce impacts				
Mitigation measures to reduce residual risk or enhance opportunities: ▪ Carefully plan to mimimise the construction period and avoid construction delays. ▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.							

▪ Vegetation clearing should take place in a phased manner. ▪ Maintain a neat construction site by removing rubble and waste materials regularly. ▪ Make use of existing gravel access roads where possible. ▪ Limit the number of vehicles travelling to and from the proposed sites, where possible. ▪ Unless there are water shortages, ensure that dust suppression techniques are implemented o on all access roads; o in all areas where vegetation clearing has taken place; o on all soil stockpiles.	
Impact to be addressed/ further investigated and assessed in Impact Assessment Phase?	YES – the amended layout would need to be investigated.

Table 8: Rating of visual impacts of the grid connection infrastructure associated with the Paulputs WEF during construction (132kV power line and on-site substation).

Impact Phase: Construction							
Potential impact description: ▪ Large construction vehicles and equipment will alter the natural character of the study area and expose visual receptors to impacts associated with construction. ▪ Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. ▪ Dust emissions and dust plumes from increased traffic on gravel roads serving the construction site may evoke negative sentiments from surrounding viewers. ▪ Surface disturbance during construction would expose bare soil which could visually contrast with the surrounding environment. ▪ Vegetation clearance required for the construction of the proposed substation is expected to increase dust emissions and alter the natural character of the surrounding area, thus creating a visual impact. ▪ Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.							
	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	M	Negative	M	M	M
With Mitigation	M	L	L	Negative	L	M	M
Can the impact be reversed?			YES – the negative effects of construction will cease once construction is complete				
Will impact cause irreplaceable loss or resources?			YES – there will be marginal loss of resources				
Can impact be avoided, managed or mitigated?			YES – mitigation measures can reduce impacts				

Mitigation measures to reduce residual risk or enhance opportunities: ▪ Carefully plan to mimimise the construction period and avoid construction delays. ▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ▪ Vegetation clearing should take place in a phased manner. ▪ Maintain a neat construction site by removing rubble and waste materials regularly. ▪ Make use of existing gravel access roads where possible. ▪ Limit the number of vehicles and trucks travelling to and from the construction site, where possible. ▪ Unless there are water shortages, ensure that dust suppression techniques are implemented o on all access roads; o in all areas where vegetation clearing has taken place; o on all soil stockpiles.

Impact to be addressed/ further investigated and assessed in Impact Assessment Phase?	YES – the amended routes would need to be investigated.

Table 9: Rating of cumulative visual impacts as a result of the nearby renewable energy developments (including associated infrastructure).

Impact Phase: Construction							
Potential impact description: ▪ Large construction vehicles and equipment associated with nearby renewable energy developments will alter the natural character of the study area and expose a greater number of visual receptors to impacts associated with construction. ▪ Visual intrusion of the additional construction activities may be exacerbated, particularly in more natural undisturbed settings. ▪ Additional construction activities in the area would generate additional traffic on gravel roads in the area thus resulting in increased impacts from dust emissions and dust plumes. ▪ Additional areas of visual contrast may occur as a result of surface disturbance at other renewable energy construction sites. Further alteration of the landscape and increased dust emissions could occur as a result of temporary stockpiling of soil at other renewable energy construction sites.							
	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	M	M	Negative	M	M	L
With Mitigation	M	M	M	Negative	M	M	L
Can the impact be reversed?	YES – The impact is partly reversible. The negative effects of construction will cease once construction is complete						
Will impact cause irreplaceable loss or resources?	YES – there will be some loss of resources						

Can impact be avoided, managed or mitigated?	YES – mitigation measures can reduce impacts
Mitigation measures to reduce residual risk or enhance opportunities: ▪ Carefully plan to mimimise the construction period and avoid construction delays. ▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ▪ Vegetation clearing should take place in a phased manner. ▪ Maintain a neat construction site by removing rubble and waste materials regularly. ▪ Make use of existing gravel access roads, where possible. ▪ Limit the number of vehicles and trucks travelling to and from the proposed sites, where possible. ▪ Where possible, ensure that dust suppression techniques are implemented o on all access roads; o in all areas where vegetation clearing has taken place; o on all soil stockpiles.	

5.7.2 Operation

Table 10: Rating of visual impacts of the proposed Paulputs WEF during operation

Impact Phase: Operation							
Potential impact description: ▪ The proposed WEF will alter the visual character of the surrounding area and expose potentially sensitive visual receptor locations to visual impacts. ▪ The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. ▪ Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers. ▪ The night time visual environment will be altered as a result of operational and security lighting as well as navigational lighting on top of the wind turbines.							
	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	M	H	Negative	M	H	M
With Mitigation	M	M	M	Negative	M	H	M
Can the impact be reversed?			YES – if any of the WEFs are decommissioned				
Will impact cause irreplaceable loss or resources?			YES – there will be a loss of resources				
Can impact be avoided, managed or mitigated?			YES – mitigation measures can reduce impacts				
Mitigation measures to reduce residual risk or enhance opportunities:							

- Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity.
- If possible, turbines should be painted plain white, as this is a less industrial colour. Bright colours and logos on the turbines should be kept to a minimum. Where one or more turbine blades are painted in an alternative colour, it is recommended that this colour is restricted to black or grey.
- Inoperative turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011).
- If turbines need to be replaced for any reason, they should be replaced with the same model, or one of equal height and scale. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscapes made up of diverse colours, textures and patterns (Vissering, 2011)
- Unless there are water shortages, dust suppression techniques are to be implemented on all access roads.
- Light fittings for security at night should reflect the light toward the ground and prevent light spill.

Table 11: Rating of visual impacts of the on-site infrastructure associated with the Paulputs WEF during operation (internal roads, construction laydown areas, O&M buildings and cabling).

Impact Phase: Operation							
Potential impact description: ▪ The on-site infrastructure required by the WEF could alter the visual character of the surrounding area and expose sensitive visual receptor locations to visual impacts. ▪ The on-site infrastructure may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. ▪ Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers. ▪ The night time visual environment could be altered by operational and security lighting emanating from the on-site substation and the operation and maintenance buildings.							
	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	M	L	Negative	L	L	M
With Mitigation	L	M	L	Negative	L	L	M
Can the impact be reversed?			YES – if the WEF is decommissioned				
Will impact cause irreplaceable loss or resources?			YES – there will be marginal loss of resources				
Can impact be avoided, managed or mitigated?			YES – mitigation measures can reduce impacts				
Mitigation measures to reduce residual risk or enhance opportunities:							

- Light fittings for security at night should reflect the light toward the ground and prevent light spill.
- The operation and maintenance buildings should not be illuminated at night.
- Where possible, the operation and maintenance buildings should be consolidated to reduce visual clutter.
- The operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible.
- Where possible, underground cabling should be utilised.
- Unless there are water shortages, dust suppression techniques are to be implemented on all access roads

Table 12: Rating of visual impacts of the grid connection infrastructure associated with the Paulputs WEF during operation (132kV power line and on-site substation).

Impact Phase: Operation							
Potential impact description: ▪ The proposed power line and substation could alter the visual character of the surrounding area and expose sensitive visual receptor locations to visual impacts. ▪ The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. ▪ Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers. ▪ The night time visual environment could be altered as a result of operational and security lighting at the proposed substation.							
	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	M	L	Negative	L	M	M
With Mitigation	L	M	L	Negative	L	M	M
Can the impact be reversed?			YES – if the power lines are decommissioned				
Will impact cause irreplaceable loss or resources?			YES – there will be marginal loss of resources				
Can impact be avoided, managed or mitigated?			YES – mitigation measures can reduce impacts				
Mitigation measures to reduce residual risk or enhance opportunities: ▪ Where possible, limit the amount of security and operational lighting present at the on-site substation. ▪ Light fittings for security at night should reflect the light toward the ground and prevent light spill. ▪ Where possible, limit the number of maintenance vehicles using access roads. ▪ Non-reflective surfaces should be utilised where possible.							

Table 13: Rating of cumulative visual impacts as a result of the nearby renewable energy developments (including associated infrastructure) during operation

Impact Phase: Operation							
Potential impact description: ▪ Additional renewable energy developments in the broader area will alter the natural character of the study area towards a more industrial landscape and expose a greater number of receptors to visual impacts. ▪ Visual intrusion of multiple renewable energy developments may be exacerbated, particularly in more natural undisturbed settings. ▪ Additional renewable energy facilities in the area would generate additional traffic on gravel roads thus resulting in increased impacts from dust emissions and dust plumes. ▪ The night time visual environment could be altered as a result of operational and security lighting at multiple renewable energy facilities in the broader area.							
	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	M	M	Negative	M	M	M
With Mitigation	M	M	M	Negative	M	M	M
Can the impact be reversed?	YES – if any of the WEFs, SEFs and associated power lines are decommissioned						
Will impact cause irreplaceable loss or resources?	YES – there will be marginal loss of resources						
Can impact be avoided, managed or mitigated?	YES – mitigation measures can reduce impacts						
Mitigation measures to reduce residual risk or enhance opportunities: ▪ Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity. ▪ If possible, turbines should be painted plain white, as this is a less industrial colour. Bright colours and logos on the turbines should be kept to a minimum. Where one or more turbine blades are painted in an alternative colour (in accordance with the recommendations of the avifaunal specialist), it is recommended that this colour is restricted to black or grey. ▪ Inoperative turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011). ▪ If turbines need to be replaced for any reason, they should be replaced with the same model, or one of equal height and scale, where possible. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscapes made up of diverse colours, textures and patterns (Vissering, 2011)							

- Unless there are water shortages, dust suppression techniques are to be implemented on all access roads.
- Light fittings for security at night should reflect the light toward the ground and prevent light spill.
- The operation and maintenance buildings should not be illuminated at night.
- The operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible.
- Where possible, overhead power lines should be aligned parallel to existing power lines and other linear features.
- As far as possible, limit the number of maintenance vehicles, which are allowed to access the sites.

5.7.3 Decommissioning

Visual impacts during the decommissioning phase are potentially similar to those associated with the construction phase.

6 FEEDBACK FROM PUBLIC PARTICIPATION PROCESS

During the Scoping phase of the EIA, the South African Heritage Resource Agency (SAHRA) provided “Interim Comment” in a letter dated 20 March 2019. One of the issues raised in this letter is SAHRA’s requirement of a 3km buffer between “any turbine placement and a National Road”. Accordingly, SiVEST was requested by Arcus to provide visual specialist inputs in relation to this buffer. SiVEST’s comments are provided below.

The N14 National Route bisects the application site for the Paulputs Wind Energy Facility (WEF) and is the primary thoroughfare in the broader study area. This route provides an important link between Johannesburg and Springbok to the east, as well as to the Namibian Border to the north. Hence the route also provides access to the many tourist attractions along the west coast and also those located along the Orange River. In light of this, the N14 was identified in the scoping phase Visual Impact Assessment (VIA) as a potentially sensitive receptor road, as it may be used by tourists who could object to the potential visual intrusion of the proposed WEF.

It is therefore assumed that SAHRA’s 3km buffer is intended to reduce the visual impacts of the proposed WEF on motorists travelling along the N14 and also reduce the potential impact on the landscape adjacent to the road. Visual impacts are however experienced differently by different types of receptors and thus some receptors may not consider a WEF to be a negative visual impact.The VIA further revealed that the section of the N14 which traverses the WEF study area does not form part of a designated tourism route and does not generally experience heavy volumes of tourist traffic. Additionally, low overall traffic volumes were noted during the VIA field visit in November 2018, largely comprising local access traffic and heavy trucks en-route to the Namibian border.

In the context of the typical Karoo “Cultural” Landscape, the VIA found that visual impacts on the cultural landscape would be reduced by the fact that the area is relatively remote and there are very few tourism or nature-based facilities in the study area. Consideration should also be given to the fact that the Karoo cultural landscape is an organically evolved, “continuing” landscape and as such, given the number of WEFs and SEFs that have been developed or are likely to be developed across the Karoo, it is possible that renewable energy facilities and wind turbines may in the future become an integral part of the typical Karoo cultural landscape.

Thus although the turbines will be highly visible to passing motorists, visual impacts will be transient and motorists are unlikely to be adversely affected by the presence of turbines within 3kms of the road. In addition, the 500m buffer recommended in the scoping phase VIA will be sufficient to mitigate the impacts of shadow flicker.

A Motivation Letter was submitted to SAHRA in this regard and an Interim Comment issued by SAHRA on 30 May 2019 stated that ‘*The SAHRA Archaeology, Palaeontology and Meteorites*

(APM) Unit accepts the above motivation to reduce the buffer between the closest wind turbine and the N14 to 500 m.'

7 CONCLUSION

An EIA level visual study was conducted to assess the magnitude and significance of the visual impacts associated with the development of the proposed Paulputs WEF and associated grid connection infrastructure near Pofadder in the Northern Cape Province. Overall, sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral elements. As such, WEF development would alter the visual character and contrast significantly with the typical land use and/or pattern and form of human elements present across the broader study area. The level of contrast will however be reduced by the presence of the KaXu, !Xina and Konkoonies SEFs, the Paulputs substation and the existing high voltage power lines in close proximity to the Paulputs WEF application site.

The area is not typically valued for its tourism significance and there is limited human habitation resulting in relatively few potentially sensitive receptors in the area. The proposed WEF development will have a high level of impact on three (3) of these receptors, and a moderate level of impact on thirteen (13) identified receptors. The proposed 132kV power line and substation will have a moderate impact on eleven (11) potentially sensitive receptors.

An overall impact rating was also conducted as part of the scoping phase in order to allow the visual impact to be assessed alongside other environmental parameters. The assessment revealed that impacts associated with the proposed WEF, associated on-site infrastructure and grid connection infrastructure will be of moderate significance during construction. This could however be reduced to low with the implementation of mitigation measures.

During operation, visual impacts from the WEF would be of moderate significance with relatively few mitigation measures available to reduce the visual impact. Visual impacts associated with the WEF on-site infrastructure and the grid connection infrastructure during operation would be of low significance.

Although other renewable energy developments and infrastructure projects, either proposed or in operation, were identified within a 35km radius of the Paulputs WEF application site, it was determined that only eleven of these would have any significant impact on the landscape within the visual assessment zone. All eleven projects are SEFs and three are already in operation. These projects are concentrated in close proximity to Paulputs substation and the surrounding landscape has already undergone noticeable change. This concentration of facilities will alter the inherent sense of place and introduce an increasingly industrial character into a largely rural area. This will result in significant cumulative impacts, rated as medium during both construction and operation phases of the project. It is however anticipated that these impacts could be mitigated to acceptable

levels with the implementation of the recommendations and mitigation measures stipulated for each of these developments by the visual specialists.

Three (3) substation site options and four (4) power lines route options were assessed as part of the EIA. All of these options are included in the EA application and as such they are not alternatives. All options were however assessed from a visual perspective and no fatal flaws were identified for any of the substation sites or power line route options.

7.1 Visual Impact Statement

It is SiVEST's opinion that the visual impacts associated with the proposed Paulputs WEF development and associated grid connection infrastructure are of moderate significance. Given the low level of human habitation and the absence of sensitive receptors, the project is deemed acceptable from a visual perspective and the EA should be granted. SiVEST is of the opinion that the impacts associated with the construction, operation and decommissioning phases of the project can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

8 REFERENCES

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Appendix A

SPECIALIST CV’s

CURRICULUM VITAE

Name	Andrea Gibb
Profession	Environmental Practitioner
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Divisional Manager Environmental Division
Years with Firm	8 Years
Date of Birth	29 January 1985
ID Number	8501290020089
Nationality	South African

Education

Matriculated 2003, Full Academic Colours, Northcliff High School, Johannesburg, South Africa

Professional Qualifications

BSc (Hons) Environmental Management (University of South Africa 2008-2010)

BSc Landscape Architecture (with distinction) (University of Pretoria 2004-2007)
Awards: Cave Klapwijk prize for highest average in all modules in the Landscape Architecture programme, ILASA book prize for the best Landscape Architecture student in third year design, Johan Barnard planting design prize for the highest distinction average in any module of plant science.

ArcGIS Desktop 1 (ESRI South Africa December 2010)
Environmental Impact Assessment (EIA) 2014 Legal Regime Workshop (Imbewu 2015)

Employment Record

Sept 2018 – to date	SiVEST SA (Pty) Ltd: Divisional Manager: Environmental Division
May 2017 – Aug 2018	SiVEST SA (Pty) Ltd: Senior Manager: Environmental Division
Aug 2010 – Apr 2017	SiVEST SA (Pty) Ltd: Environmental Practitioner
Jan 2008 – July 2010	Cave Klapwijk and Associates: Environmental Assistant and Landscape Architectural Technologist
Feb 2006 – Dec 2006	Cave Klapwijk and Associates: Part time student

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent

CURRICULUM VITAE

Andrea Gibb

Key Experience

Andrea has over 10 years' work experience and is employed by SiVEST's Environmental Division as the Divisional Manager heading up the Renewable Energy Sector in the Johannesburg Office. She specialises in overseeing large scale multifaceted Environmental Impact Assessments (EIAs) and Basic Assessments (BAs) throughout South Africa, undertaken according to International Finance Corporation (IFC) standards and Equator Principles, within the renewable energy generation and electrical distribution sectors. From a business development perspective Andrea assists the division by marketing the environmental services and identifying prospective clients. She enjoys guiding, mentoring and motivating the team to find their niche and improve their input. Andrea further specialises in visual impact assessments (VIAs) and has developed a specialist team who she oversees.

Skills include:

- Project and team management
- Marketing and business development
- Financial management
- Client liaison and relationship management
- Team leadership
- Mentorship and training
- Report writing and review
- Documentation / quality control

Projects Experience

Aug 2010 – to date

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) / BASIC ASSESSMENT (BA)

- BA for the proposed construction of the Grasskoppies Substations and Power Line near Loeriesfontein, Northern Cape Province.
- BA for the proposed construction of the Ithemba Substations and Power Line near Loeriesfontein, Northern Cape Province.
- BA for the proposed construction of the Hartebeest Leegte Substations and Power Line near Loeriesfontein, Northern Cape Province.
- BA for the proposed construction of the !Xha Boom Substations and Power Line near Loeriesfontein, Northern Cape Province.
- EIA for the proposed construction of the Grasskoppies Wind Farm near Loeriesfontein, Northern Cape Province.
- EIA for the proposed construction of the Ithemba Wind Farm near Loeriesfontein, Northern Cape Province.
- EIA for the proposed construction of the Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province.
- EIA for the proposed construction of the !Xha Boom Wind Farm near Loeriesfontein, Northern Cape Province.
- Application for an Amendment of the Environmental Authorisation (EA) for the proposed construction of the Droogfontein II PV Plant near Kimberley, Northern Cape Province.
- Amendment and Resubmission of the FBAR for the Eskom Longdown Substation and Vyeboom 66kV Turn-in Power Lines near Villiersdorp, Western Cape Province.
- BA for the proposed construction of the Leeuwbosch Power Plant near Leeudoringstad, North West Province.

- BA for the proposed construction of the Wildebeestkuil Power Plant near Leeudoringstad, North West Province.
- EIA for the proposed development of the Tlisitseng 1 and 2 75MW Solar Photovoltaic (PV) Energy Facilities near Lichtenburg, North West Province.
- EIAs for the proposed development of the Sendawo 1, 2, and 3 75MW Solar PV Energy Facilities near Vryburg, North West Province.
- EIA for the proposed construction of the Sendawo Common Collector Substation and power line near Vryburg, North West Province.
- EIA for the proposed construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province.
- Application for an Amendment of the Environmental Authorisation (EA) for the proposed construction of the 100MW Limestone Solar Thermal Power Project near Danielskuil, Northern Cape Province.
- Applications for the Amendment of the EAs for the proposed construction of three 75MW solar PV facilities near Prieska, Northern Cape Province.
- Applications for the Amendment of the EAs for the proposed construction of the 75MW Arriesfontein and Wilger Solar Power Plants near Danielskuil, Northern Cape Province.
- Completion and submission of the final EIA report for the proposed Rooipunt PV Solar Power Park Phase 1 and proposed Rooipunt PV Solar Power Park Phase 2 near Upington, Northern Cape Province.
- EIAs for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- EIA for the proposed construction of the Nokukhanya 75MW Solar PV Power Plant near Dennilton, Limpopo Province.
- EIA for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- BA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province.
- BA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province.
- BA for the proposed Construction of the SSS1 5MW Solar PV Plant on the Western Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province.
- BA for the proposed Construction of the SSS2 5MW Solar PV Plant on the Eastern Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the proposed Bophirima Substation to the existing Schweizer-Reneke Substation, North West Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the Mookodi Substation to the existing Magopela Substation, North West Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of the Mookodi - Ganyesa 132kV power line, proposed Ganyesa Substation and Havelock LILO, North West Province.
- Amendment of the Final Environmental Impact Report for the Proposed Mookodi 1 Integration Project near Vryburg, North West Province.
- BA for the proposed 132kV power line and associated infrastructure for the proposed Redstone Solar Thermal Energy Plant near Lime Acres, Northern Cape Province.
- BA for the proposed construction of a 132kV power line and substation associated with the 75MW PV Plant on the Farm Droogfontein (PV 3) in Kimberley, Northern Cape Province.
- BA for the proposed establishment of a Learning and Development Retreat and an Executive Staff and Client Lodge at Mogale's Gate, Gauteng Province.
- Application for an Amendment of the EA to increase the output of the proposed 40MW PV Facility on the farm Mierdam to 75MW, Northern Cape Province.

- BA for the proposed construction of a power line and substation near Postmasburg, Northern Cape Province.
- BA for the proposed West Rand Strengthening Project – 400kV double circuit power line and substation extension in the West Rand, Gauteng.
- EIA for the proposed construction of a wind farm and PV plant near Prieska, Northern Cape Province.
- Public Participation assistance as part of the EIA for the proposed Thyspunt Transmission Lines Integration Project – EIA for the proposed construction of 5 x 400kV transmission power lines between Thyspunt to Port Elizabeth, Eastern Cape Province.
- EIA assistance for the proposed construction of three Solar Power Plants in the Northern Cape Province.
- Public Participation as part of the EIA for the proposed Delareyille Kopela Power Line and Substation, North West Province.
- Public Participation as part of the EIA for the Middelburg Water Reclamation Project, Mpumalanga Province.

VISUAL IMPACT ASSESSMENT (VIA)

- VIA for the proposed construction of the Mlonzi Golf Estate and Hotel Development, Eastern Cape Province.
- VIA for the proposed Tinley Manor South Banks Beach Enhancement Solution, KwaZulu-Natal Province.
- VIA for the proposed construction of the Grasskoppies Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed construction of the Ithemba Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed construction of the Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed construction of the !Xha Boom Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed Phezukomoya Wind Energy Facility near Noupoort, Northern Cape Province.
- VIA for the proposed San Kraal Wind Energy Facility near Noupoort, Northern Cape Province
- VIA for the proposed Assagay Valley Mixed Use Development, KwaZulu-Natal Province.
- VIA for the proposed Kassier Road North Mixed Use Development, KwaZulu-Natal Province.
- VIA for the proposed construction of a power line and associated infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberley, Free State and Northern Cape Provinces.
- VIA (Scoping Phase) for the proposed construction of a 3000MW Wind Farm and associated infrastructure near Richmond, Northern Cape Province.
- VIA for the proposed construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province.
- VIA for the proposed construction of a power line and associated infrastructure for the proposed Rooipunt Solar Thermal Power Plant near Upington, Northern Cape Province.
- VIAs (Impact Phase) for the proposed construction of the Sendawo 1, 2 and 3 solar PV energy facilities near Vryburg, North West Province.
- VIA (Impact Phase) for the proposed construction of the Sendawo substation and associated power line near Vryburg, North West Province.
- VIAs (Impact Phase) for the proposed construction of the Tlisitseng 1 and 2 solar PV energy facilities near Lichtenburg, North West Province.
- VIA for the proposed construction of the Tlisitseng substation and associated 132kV power line near Lichtenburg, North West Province.
- VIA (Scoping Phase) for the proposed construction of the Sendawo substation and associated power line near Vryburg, North West Province.
- VIA (Scoping Phase) for the proposed construction of the Sendawo 1, 2 and 3 solar PV energy facilities near Vryburg, North West Province.

- VIA (Scoping Phase) for the proposed construction of the Tlisitseng 1 and 2 solar PV energy facilities near Lichtenburg, North West Province.
- Visual recommendations for Phase 1 of the proposed Renishaw Estate Mixed Use Development, KwaZulu-Natal Province.
- VIA for the proposed Tinley Manor South Banks Development, KwaZulu-Natal Province.
- VIAs (Impact Phase) for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- VIA (Scoping Phase) for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- Visual Due Diligence Report for the possible rapid rail extensions to the Gauteng network, Gauteng Province.
- Visual Status Quo and Constraints Report for the possible rapid rail extensions to the Gauteng network, Gauteng Province.
- VIA for the proposed agricultural components of the Integrated Sugar Project in Nsoko, Swaziland.
- VIA for the proposed Tweespruit to Welroux power lines and substation, Free State Province.
- VIA for the proposed construction of the Nokukhanya 75MW Solar PV Power Plant near Dennilton, Limpopo Province.
- VIA (Impact Phase) for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed amendment to the authorised power line route from Hera Substation to Westgate Substation, Gauteng Province.
- VIA (Impact Phase) for the Eastside Junction Mixed Use Development near Delmas, Mpumalanga Province.
- VIA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province.
- VIA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province.
- VIA (Scoping Phase) for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed Rorqual Estate Development near Park Rynie on the South Coast of KwaZulu Natal.
- VIA (Scoping Phase) for the proposed construction of a Coal-fired Power Station, Coal Mine and Associated Infrastructure near Colenso, KwaZulu-Natal Province.
- VIA for the proposed Mookodi Integration Phase 2: Proposed Construction of the Mookodi - Ganyesa 132kV power line, proposed Ganyesa Substation and Havelock LILO, North West Province.
- VIA for the proposed construction of the Duma transmission substation and associated Eskom power lines, KwaZulu-Natal Province.
- VIA for the proposed construction of the Madlanzini transmission substation and associated Eskom power lines, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Normandie substation to Hlungwane substation, Mpumalanga and KwaZulu-Natal Provinces.
- VIA for the proposed construction of the Nzalo transmission substation and associated Eskom power lines, KwaZulu-Natal Province.
- VIA for the proposed construction of the Sheepmoor traction substation with two 20MVA transformer bays and a new associated 88kV turn-in power line, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Uitkoms substation to Antra T-off, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Umfolozi substation to Eqwasha traction substation including an 88kV turn-in power line to Dabula traction substation, Kwazulu-Natal Province.
- VIA for the proposed construction of the new 88/25kV Vryheid traction substation with two 20MVA transforma bays and a new associated 88kV turn-in power line, KwaZulu-Natal Province.

- VIA for the proposed construction of a 132kV power line and substation associated with the 75MW PV Plant on the Farm Droogfontein (PV 3) in Kimberley, Northern Cape Province.
- VIA (Impact Phase) for the proposed Construction of a Solar PV Power Plant near De Aar, Northern Cape Province.
- VIA for the (Impact Phase) proposed Construction of the Renosterberg Wind Farm near De Aar, Northern Cape Province.
- VIA for the (Impact Phase) proposed Construction of the Renosterberg Solar PV Power Plant near De Aar, Northern Cape Province.
- VIA for the proposed construction of a 132kV power line for the Redstone Thermal Energy Plant near Lime Acres, Northern Cape Province.
- VIA for the proposed Mookodi Integration phase 2 132kV power lines and Ganyesa substation near Vryburg, North West Province.
- VIA for the proposed 132kV power lines associated with the PV Plants on Droogfontein Farm near Kimberley, Northern Cape Province.
- VIA (Scoping phase) for the Eastside Junction Mixed Use Development near Delmas, Mpumalanga Province.
- VIA for the proposed development of a learning and development retreat and an executive and staff lodge at Mogale's Gate, Gauteng Province.
- VIA for the proposed construction of a substation and 88kV power line between Heilbron (via Frankfort) and Villiers, Free State Province.
- Visual Status Quo Assessment for the Moloto Development Corridor Feasibility Study in the Gauteng Province, Limpopo Province and Mpumalanga Province.
- VIA the West Rand Strengthening Project – 400kV double circuit power line and substation extension in the West Rand, Gauteng.
- VIA for the proposed construction of a wind farm and solar photovoltaic plant near Loeriesfontein, Northern Cape Province.
- Visual sensitivity mapping exercise for the proposed Mogale's Gate Expansion, Gauteng.
- VIA (Scoping Phase) for the proposed Renosterberg Solar PV Power Plant and Wind Farm near De Aar, Northern Cape Province.
- Scoping level VIAs for the proposed construction of three Solar Power Plants in the Northern Cape Province.
- VIAs for the Spoornet Coallink Powerline Projects in KZN and Mpumalanga.
- Visual Constraints Analysis for the proposed establishment of four Wind Farms in the Eastern and Northern Cape Province.
- VIA (Scoping Phase) for the proposed development of a solar energy facility in De Aar, Northern Cape.
- VIA (Scoping Phase) for the proposed development of a solar energy facility in Kimberley, Northern Cape.

STRATEGIC ENVIRONMENTAL PLANNING

- Assistance with the Draft Environmental Management Framework for the Mogale City Local Municipality, Gauteng Province.
- Sensitivity Negative Mapping Analysis for the proposed Mogale's Gate Development, Gauteng Province.

CURRICULUM VITAE

Name	Kerry Lianne Schwartz
Profession	GIS Specialist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Senior GIS Consultant: Environmental Division
Years with Firm	30 Years
Date of Birth	21 October 1960
ID No.	6010210231083
Nationality	South African

Professional Qualifications

BA (Geography), University of Leeds 1982

Membership to Professional Societies

South African Geomatics Council – GTc GISc 1187

Employment Record

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1994 – Present	SiVEST SA (Pty) Ltd - Environmental Division: GIS/Database Specialist.
1988 - 1994	SiVEST (formerly Scott Wilson Kirkpatrick): Town Planning Technician.
1984 – 1988	Development and Services Board, Pietermaritzburg: Town Planning Technician.

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent

Key Experience

Kerry is a GIS specialist with more than 20 years' experience in the application of GIS technology in various environmental, regional planning and infrastructural projects undertaken by SiVEST.

Kerry's GIS skills have been extensively utilised in projects throughout South Africa in other Southern African Countries. These projects have involved a range of GIS work, including:

- Design, compilation and management of a demographic, socio-economic, land use, environmental and infrastructural databases.
- Collection, collation and integration of data from a variety of sources for use on specific projects.
- Manipulation and interpretation of both spatial and alphanumeric data to provide meaningful inputs for a variety of projects.
- Production of thematic maps and graphics.
- Spatial analysis and 3D modelling, including visual and landscape assessments.

Projects Experience

STRATEGIC PLANNING PROJECTS

Provision of database, analysis and GIS mapping support for the following:

- Water Plan 2025: Socio-economic, Land Use and Demographic Update – Umgeni Water (KwaZulu-Natal).
- Eskom Strategic Plan – Eskom (KwaZulu-Natal).
- Umgeni Water Quality Management Plan – Department of Water Affairs and Umgeni Water (KwaZulu-Natal).
- KwaZulu-Natal Development Perspective – Department of Economic Affairs (KwaZulu-Natal).
- Indlovu Regional Integrated Plan – Department of Local Government and Housing (KwaZulu-Natal).
- Umgeni Water and Sanitation Needs Analysis – Umgeni Water (KwaZulu-Natal).
- Metro Waste Water Management Plan – Durban Waste Water management, City of Durban (KwaZulu-Natal).
- KwaZulu-Natal Electrification Prioritisation Model – Eskom (KwaZulu-Natal).
- Umzinyathi Regional Development Plan – Umzinyathi Regional Council (KwaZulu-Natal).
- GIS driven model to assess future population growth in quaternary catchments under different growth scenarios – Umgeni Water (KwaZulu-Natal).
- Ubombo Master Water Plan Study – Mhlathuze Water Board (KwaZulu-Natal).
- Development strategy for local economic development and social reconstruction of the Germiston-Daveyton Activity Corridor – Eastern Gauteng Services Council (Gauteng).
- Land identification study for low cost housing in the Indlovu Region – Indlovu Regional Council (KwaZulu-Natal).
- Local Development Plan for Manzini – Manzini Town Council (Swaziland).
- Database development for socio-economic and health indicators arising from Social Impact Assessments conducted for the Lesotho Highlands Development Association – Lesotho.
- Development Plan for the adjacent towns of Kasane and Kazungula - Ministry of Local Government, Land and Housing (Botswana).
- Development Plan for the rural village of Hukuntsi - Ministry of Local Government, Land and Housing (Botswana).
- Integrated Development Plans for various District and Local Municipalities including:
  - Nquthu Local Municipality (KwaZulu-Natal)
  - Newcastle Local Municipality (KwaZulu-Natal)
  - Amajuba District Municipality (KwaZulu-Natal)
  - Jozini Local Municipality (KwaZulu-Natal)
  - Umhlabuyalingana Local Municipality (KwaZulu-Natal)
- uMhlathuze Rural Development Initiative – uMhlathuze Local Municipality (KwaZulu-Natal).
- Rural roads identification – uMhlathuze Local Municipality (KwaZulu-Natal).
- Mapungubwe Tourism Initiative – Development Bank (Limpopo Province).
- Northern Cape Tourism Master Plan – Department of Economic Affairs and Tourism (Northern Cape Province).
- Spatial Development Framework for Gert Sibande District Municipality (Mpumalanga) in conjunction with more detailed spatial development frameworks for the 7 Local Municipalities in the District, namely:
  - Albert Luthuli Local Municipality
  - Msukaligwa Local Municipality
  - Mkhondo Local Municpality

  - Pixley Ka Seme Local Municipality
  - Dipaleseng Local Municipality
  - Govan Mbeki Local Municipality
  - Lekwa Local Municipality
- Land Use Management Plans/Systems (LUMS) for various Local Municipalities including:
  - Nkandla Local Municipality (KwaZulu-Natal)
  - Hlabisa Local Municipality (KwaZulu-Natal)
  - uPhongolo Local Municipality (KwaZulu-Natal)
  - uMshwathi Local Municipality
- Spatial Development Framework for uMhlathuze Local Municipality (KwaZulu-Natal).
- Spatial Development Framework for Greater Clarens – Maloti-Drakensberg Transfrontier Park (Free State).
- Land use study for the Johannesburg Inner City Summit and Charter – City of Johannesburg (Gauteng).
- Port of Richards Bay Due Diligence Investigation – Transnet
- Jozini Sustainable Development Plan – Jozini Local Municipality (KwaZulu-Natal)
- Spatial Development Framework for Umhlabuyalingana Local Municipality (KwaZulu-Natal)

BUILT INFRASTRUCTURE

- EIA and EMP for a 9km railway line and water pipeline for manganese mine – Kalagadi Manganese (Northern Cape Province).
- EIA and EMP for 5x 440kV Transmission Lines between Thyspunt (proposed nuclear power station site) and several substations in the Port Elizabeth area – Eskom (Eastern Cape Province).
- Initial Scoping for the proposed 750km multi petroleum products pipeline from Durban to Gauteng/Mpumalanga – Transnet Pipelines.
- Detailed EIA for multi petroleum products pipeline from Kendall Waltloo, and from Jameson Park to Langlaagte Tanks farms –Transnet Pipelines.
- Environmental Management Plan for copper and cobalt mine (Democratic Republic of Congo).
- EIA and Agricultural Feasibility study for Miwani Sugar Mill (Kenya).
- EIAs for Concentrated Solar and Photovoltaic power plants and associated infrastructure (Northern Cape, Free State, Limpopo and North West Province).
- EIAs for Wind Farms and associated infrastructure (Northern Cape and Western Cape).
- Basic Assessments for 132kV Distribution Lines (Free State, KwaZulu-Natal, Mpumalanga and North West Province).
- Environmental Assessment for the proposed Moloto Development Corridor (Limpopo).
- Environmental Advisory Services for the Gauteng Rapid Rail Extensions Feasibility Project.
- Environmental Screening for the Strategic Logistics and Industrial Corridor Plan for Strategic Infrastructure Project 2, Durban-Free State-Gauteng Development Region.

STATE OF THE ENVIRONMENT REPORTING

- 2008 State of the Environment Report for City of Johannesburg.
- Biodiversity Assessment – City of Johannesburg.

STRATEGIC ENVIRONMENTAL ASSESSMENTS AND ENVIRONMENTAL MANAGEMENT FRAMEWORKS

- SEA for Greater Clarens – Maloti-Drakensberg Transfrontier Park (Free State).

- SEA for the Marula Region of the Kruger National Park, SANParks.
- SEA for Thanda Private Game Reserve (KwaZulu-Natal).
- SEA for KwaDukuza Local Municipality (KwaZulu-Natal).
- EMF for proposed Renishaw Estate (KwaZulu-Natal).
- EMF for Mogale City Local Municipality, Mogale City Local Municipality (Gauteng).
- SEA for Molemole Local Municipality, Capricorn District Municipality (Limpopo).
- SEA for Blouberg Local Municipality, Capricorn District Municipality (Limpopo).
- SEA for the Bishopstowe study area in the Msunduzi Local Municipality (KwaZulu-Natal).

WETLAND STUDIES

- Rehabilitation Planning for the Upper Klip River and Klipspruit Catchments, City of Johannesburg (Gauteng).
- Wetland assessments for various Concentrated Solar and Photovoltaic power plants and associated infrastructure (Limpopo, Northern Cape, North West Province and Western Cape).
- Wetland assessments for Wind Farms and associated infrastructure (Northern Cape and Western Cape).
- Wetland assessments for various 132kV Distribution Lines (Free State, KwaZulu-Natal, Mpumalanga and North West Province).

VISUAL IMPACT ASSESSMENTS

- VIA for the Thyspunt Transmission Lines Integration Project (Eatern Cape).
- VIA s for various Solar Power Plants and associated grid connection infrastructure (Northern Cape, Free State, Limpopo and North West Province).
- VIAs for various Wind Farms and associated grid connection infrastructure (Northern Cape and Western Cape), the most recent projects including:
  - Graskoppies, Hartebeest Leegte, Ithemba and !Xha Boom Wind Farms near Loeriesfontein (Northern Cape);
  - Kuruman 1 and 2 WEFs near Kuruman (Northern Cape);
  - San Kraal and Phezukomoya WEFs near Noupoort (Northern Cape);
  - Paulputs WEF near Pofadder (Northern Cape)
  - Kudusberg WEF near Matjiesfontein (Western Cape);
  - Tooverberg WEF, near Touws River (Western Cape);
  - Rondekop WEF, near Sutherland (Northern Cape).
- VIAs for various 132kV Distribution Lines (Free State, KwaZulu-Natal, Mpumalanga and North West Province).
- VIA for the proposed Rorqual Estate Development near Park Rynie on the South-Coast of KwaZulu-Natal Province.
- VIA for the proposed Assagay Valley Mixed Use Development (KwaZulu-Natal).
- VIA for the proposed Kassier Road North Mixed Use Development (KwaZulu-Natal).
- VIA for the proposed Tinley Manor South Banks Development (KwaZulu-Natal).
- VIA for the proposed Tinley Manor South Banks Beach Enhancement Solution, (KwaZulu-Natal).
- VIAs for the proposed Mlonzi Hotel and Golf Estate Development (Eastern Cape Province).
- Visual sensitivity mapping exercise for the proposed Mogale's Gate Lodge Expansion (Gauteng).
- Analysis phase visual assessment for the proposed Renishaw Estate Environmental Management Framework in the Scottburgh Area (KwaZulu-Natal).
- Landscape Character Assessment for Mogale City Environmental Management Framework (Gauteng).