ARCUS CONSULTANCY SERVICES SOUTH AFRICA (PTY) LTD

Proposed Amendment to the Authorised Phezukomoya Wind Energy Facility near Noupoort, Northern Cape Province: Hartebeesthoek West (Phezukomoya Split 2)

Visual Impact Assessment Report

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Document Title:	Proposed Amendment to the Authorised 275MW Phezukomoya Wind Energy Facility near Noupoort, Northern Cape Province: Hartebeesthoek West (Phezukomoya Split 2)
Version Number:	1
Author:	Kerry Schwartz
Checked by:	Andrea Gibb
Approved by:	Andrea Gibb
Signature:	
Client:	Arcus Consultancy Services South Africa (Pty) Ltd

Confidentiality Statement

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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Date Received:	

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 Amendment to the Authorised Phezukomoya Wind Energy Facility near Noupoort, Northern Cape Province: Hartebeesthoek West (Phezukomoya Split 2).

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
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Departmental Details

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Private Bag X447
Pretoria
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Physical address:
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Attention: Chief Director: Integrated Environmental Authorisations
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 SA (Pty) Ltd			
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)			
Physical address:	51 Wessels Road, Rivonia			
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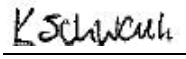
2. DECLARATION BY THE SPECIALIST

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 SA (Pty) Ltd

Name of Company:

7th August 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 SA (Pty) Ltd

Name of Company

7th August 2019

Date

Signature of the Commissioner of Oaths

07/08/2019

Date

Jacqueline Chantel Jackson
COMMISSIONER OF OATHS

Signature:

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

Date: 07/08/2019 Place: PMB

Business Address: VCC Estate, 170 Peter Brown Drive, PMB

CONTENTS OF THE SPECIALIST REPORT – CHECKLIST FOR APPENDIX 6 (SPECIALIST REPORTS) OF GNR 326

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
(1) A specialist report prepared in terms of the 2014 EIA Regulations (as amended) must contain—	
(a) details of – i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a *curriculum vitae*;	**Section 1.4**. Specialist CV's are included in **Appendix B**.
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	**Page iii - vi**
(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**
(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 7**
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	**Section 1.5.1**
(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 6** **Section 7**
(g) an identification of any areas to be avoided, including buffers;	**Section 6**
(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 6**
(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 or activities;	**Section 5** **Section 7** **Section 8** **Section 9**
(k) any mitigation measures for inclusion in the EMPr;	**Section 7.6**
(l) any conditions for inclusion in the environmental authorisation;	N/A
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	N/A
(n) a reasoned opinion—	**Section 9.1**

(i) 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 description of any consultation process that was undertaken during the course of preparing the specialist report;	**Section 1.5.6**
(p) 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.
(q) 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 AMENDMENT TO THE AUTHORISED 275MW PHEZUKOMOYA WIND ENERGY FACILITY NEAR NOUPOORT, NORTHERN CAPE PROVINCE: HARTEBEESTHOEK WEST (PHEZUKOMOYA SPLIT 2)

VISUAL IMPACT ASSESSMENT REPORT

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GLOSSARY OF TERMS

ABBREVIATIONS

DEIAR	Draft Environmental Impact Assessment Report
DoE	Department of Energy
DTM	Digital terrain model
DSR	Draft Scoping Report
EIA	Environmental Impact Assessment
FEIAR	Final Environmental Impact Assessment Report
FSR	Final Scoping Report
GIS	Geographic Information System
I&AP	Interested and/or Affected Party
kV	Kilovolt
MTS	Main Transmission Substation
MW	Megawatt
NGI	National Geo-spatial Information
O&M	Operation & Maintenance
REIPPP	Renewable Energy Independent Power Producer Programme
ROD	Record of Decision
SANBI	South African National Biodiversity Institute
VIA	Visual Impact Assessment
WEF	Wind Energy Facility

DEFINITIONS

Anthropogenic feature: An unnatural feature as a result of human activity.

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

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.

Study area / Visual assessment zone: The study area or visual assessment zone is assumed to encompass a zone of 8km from the proposed turbine locations.

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

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

Viewshed: The outer boundary defining a visual envelope, usually along crests and ridgelines.

Visual character: The physical elements and forms and land use related characteristics that make up a landscape and elicit a specific visual quality or nature. Visual character can be defined based on the level of change or transformation from a completely natural setting.

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 envelope: A geographic area, usually defined by topography, within which a particular project or other feature would generally be visible.

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 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), the 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 AMENDMENT TO THE AUTHORISED 275MW PHEZUKOMOYA WIND ENERGY FACILITY NEAR NOUPOORT, NORTHERN CAPE PROVINCE: HARTEBEESTHOEK WEST (PHEZUKOMOYA SPLIT 2)

VISUAL IMPACT ASSESSMENT REPORT

1 INTRODUCTION

The DEA granted environmental authorisation (EA) on 28th June 2018 for the proposed construction of the 275MW Phezukomoya Wind Energy Facility (WEF) with associated grid connection infrastructure near Noupoort in the Northern Cape Province. The developer, EDF Renewables (Pty) Ltd (hereafter referred to as EDF) has in the interim decided to split the proposed Phezukomoya WEF into two separate WEFs and a Part 2 Amendment application is required to accommodate these changes.

Accordingly, SiVEST has been appointed to revise and update the Visual Impact Assessment (VIA) report previously compiled for the Phezukomoya WEF project and to provide an assessment of the proposed changes to the authorised WEF layout to accommodate the smaller WEF project, now known as Hartebeesthoek West WEF. As per the original VIA, this VIA aims to determine the potential visual issues and impacts that may arise from the proposed development by characterising the visual environment of the study area and identifying areas of visual sensitivity. The report aims to classify the visual impact of the proposed development and identify how the visual environment, and in particular, any receptors within the study area may be affected by visual impacts associated with the proposed development.

1.1 Project Description

The previous VIA for the Phezukomoya project assessed proposals for a WEF, comprising up to 55 turbines and associated infrastructure with a total generation capacity of 275MW. Grid connection proposals linking the WEF to the proposed Umsobomvu MTS via a 132kV power line were also assessed as part of the VIA. Elements assessed in the previous VIA are shown in **Figure 1**.

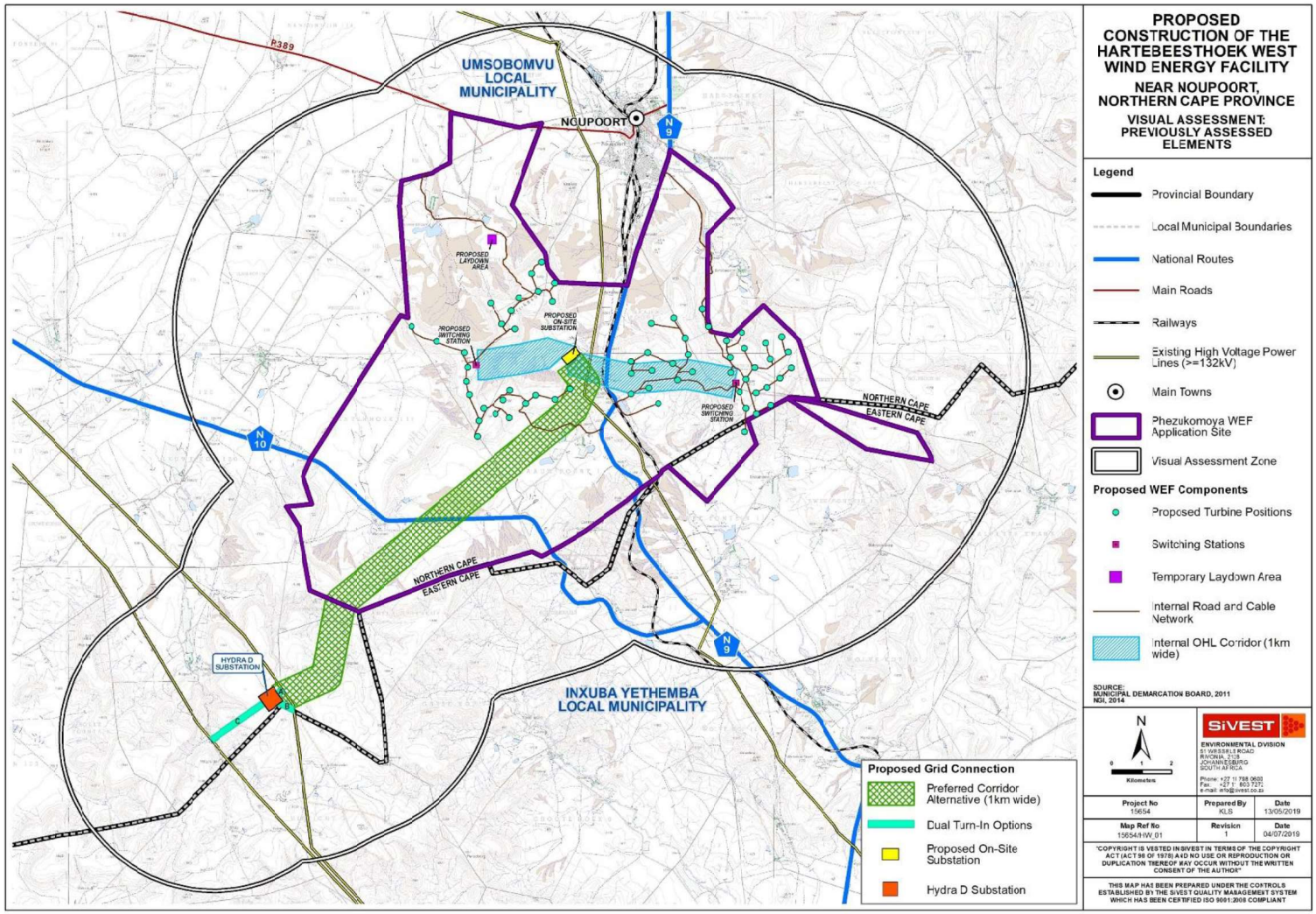


Figure 1: Elements of the Phezukomoya WEF previously assessed.

As stated above, the developer has decided to split the approved Phezukomoya WEF project into two (2) separate WEFs. These WEFs are known as Phezukomoya Split 1 WEF and Hartebeesthoek West WEF. This amended VIA provides an assessment of the proposed Hartebeesthoek West (Phezukomoya Split 2) WEF.

The Hartebeesthoek West WEF development is located within the original application site for the Phezukomoya WEF, on a site of approximately 1 100ha (**Figure 2**). Proposed amendments to the authorised WEF development are outlined below.

Amendments are also proposed in respect of the authorised grid connection infrastructure, although these amendments will be dealt with under a separate Basic Assessment process.

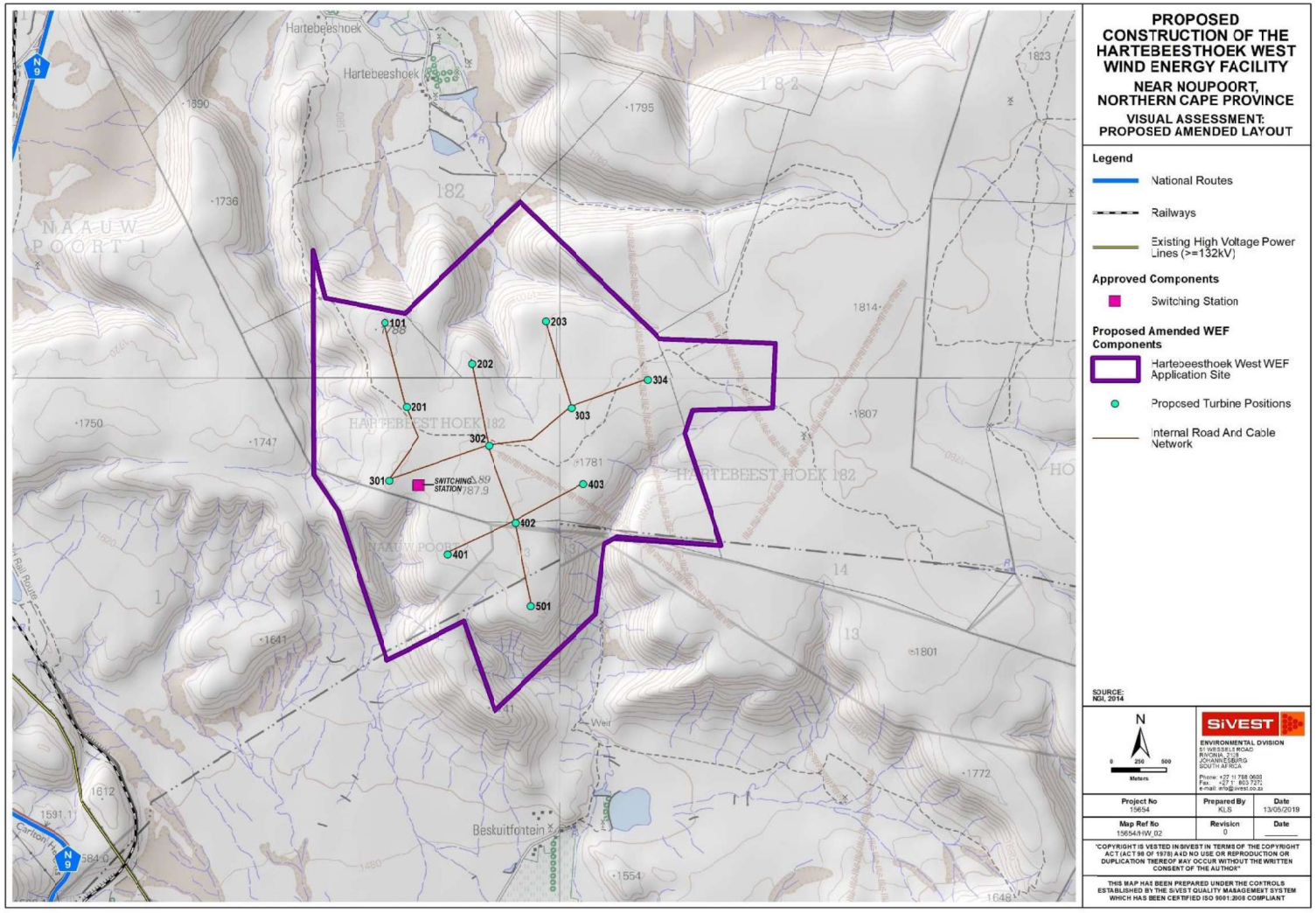


Figure 2: Proposed amended WEF layout

1.1.1 Turbines

The Environmental Authorisation (EA) for the Phezukomya WEF included the following specifications:

- Up to 55 wind turbines, each with a generation capacity of between 3 and 5MW, resulting in a total generation capacity of up to 275MW.
- The wind turbines will have a maximum hub height of 150m, a maximum rotor diameter of 150m and a blade length of 75m.

The proposed Hartebeesthoek West WEF essentially involves amending the original Phezukomya WEF proposals to provide for:

- Up to 12 wind turbines located on the eastern portion of the original Phezukomoya WEF application site, each with a generation capacity of up to 6.2MW, resulting in a total generation capacity of up to 74.4MW.
- The wind turbines will have a maximum hub height of 137m, a maximum rotor diameter of 175m (**Figure 3**).
- New turbine placements on the site which are outside of the environmental constraints identified in the Phezukomya WEF EIA.

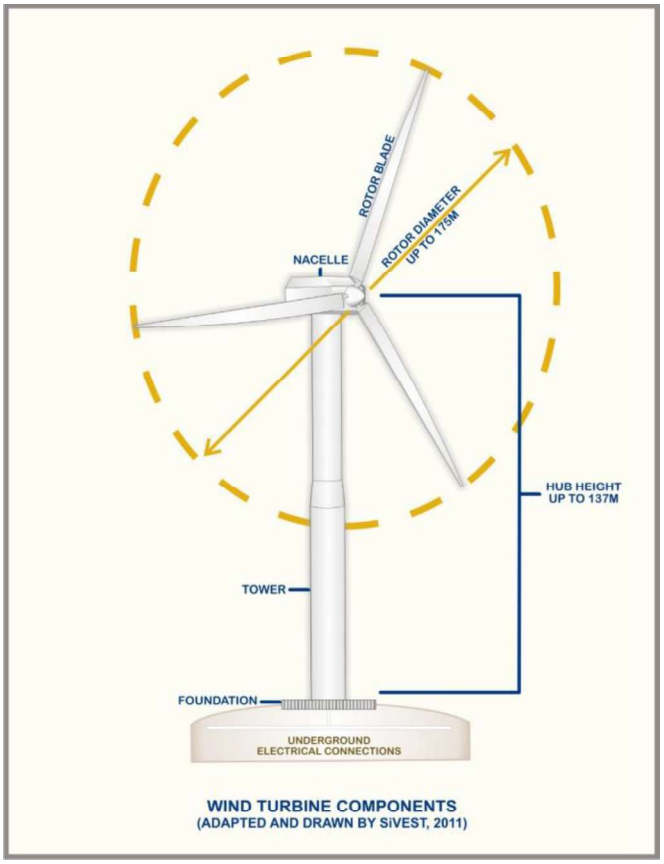


Figure 3: Typical components of a wind turbine

1.1.2 Roads

The layout of internal access roads has been revised to accommodate the new 12 turbine layout. These roads will have a maximum width of 14m during the construction phase, although this will be reduced to approximately 8m for maintenance purposes during the operational phase.

1.1.3 WEF Electrical Infrastructure

The electrical infrastructure includes an on-site switching station connected by way of overhead medium voltage cables. As these elements of the layout have been authorised, they will not be assessed in this VIA.

The proposed wind turbines will be connected to an on-site switching station by way of medium voltage underground cables which will follow the alignment of the internal access roads. Where underground cabling is not feasible, such as river crossings and road crossings, overhead cabling will be required. (**Figure 4**).

As mentioned, amended grid connection proposals are being assessed as part of a separate BA application.

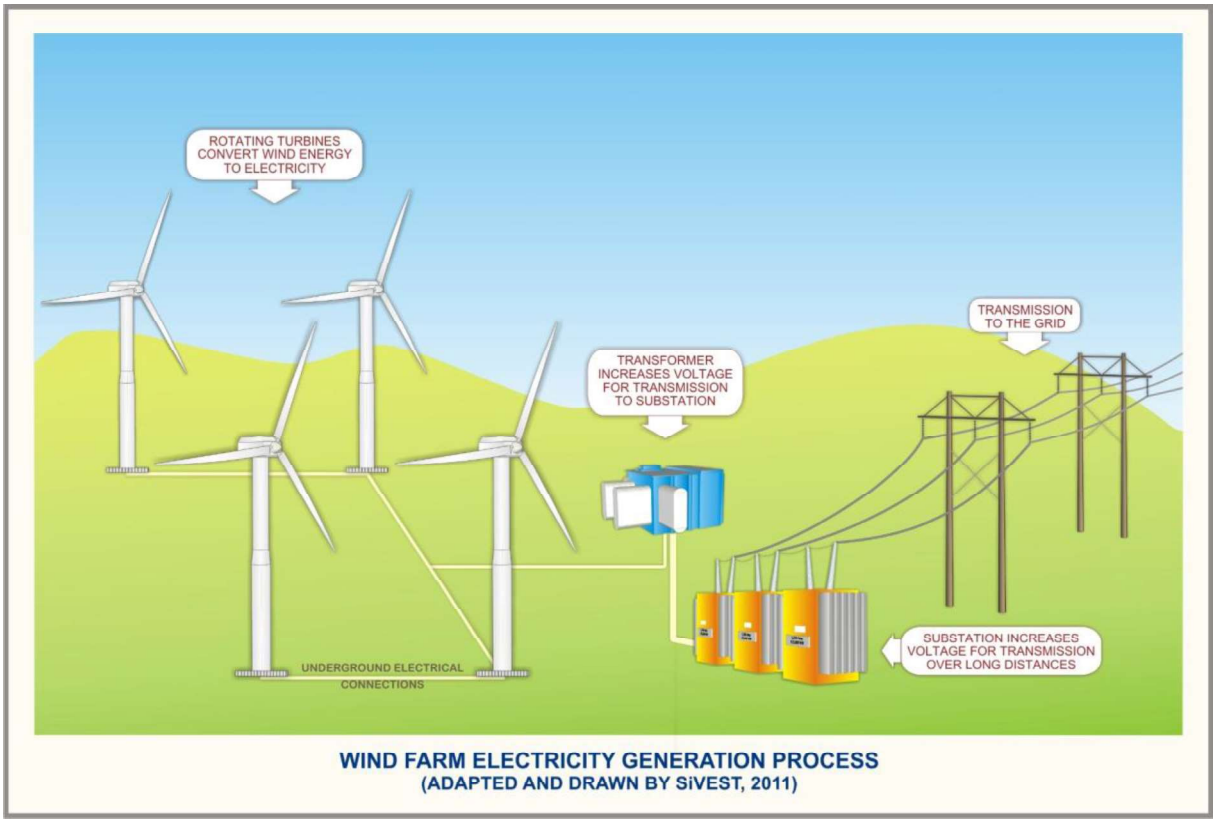


Figure 4: Conceptual wind farm electricity generation process showing electrical connections

1.1.4 Operations and Maintenance Facilities

The operation and maintenance (O&M) facilities will be located on the approved Phezukomoya Substation site which is approximately 180 000m^2 in extent. As this site has been authorised, it will not be assessed in this VIA.

1.1.5 Batching Plant, Temporary Lay Down Area and Construction Compound

The EA for the Phezukomoya WEF made provision for one site to accommodate the proposed batching plant, temporary laydown area and construction compound. This site is now outside the Hartebeesthoek West WEF application site and will not be assessed in this VIA, and as the site has been approved, no further visual assessment will be required.

1.1.6 Other Temporary Infrastructure

Other temporary infrastructure will include an area of approximately 7500m^2 per turbine to accommodate site camps and temporary laydown areas.

1.2 Site Location

The proposed WEF is located approximately 7km south-east of the town of Noupoort within the Umsobomvu Local Municipality in the Northern Cape Province (**Figure 5**). The application site comprises several farms and is approximately 1 100ha in extent.

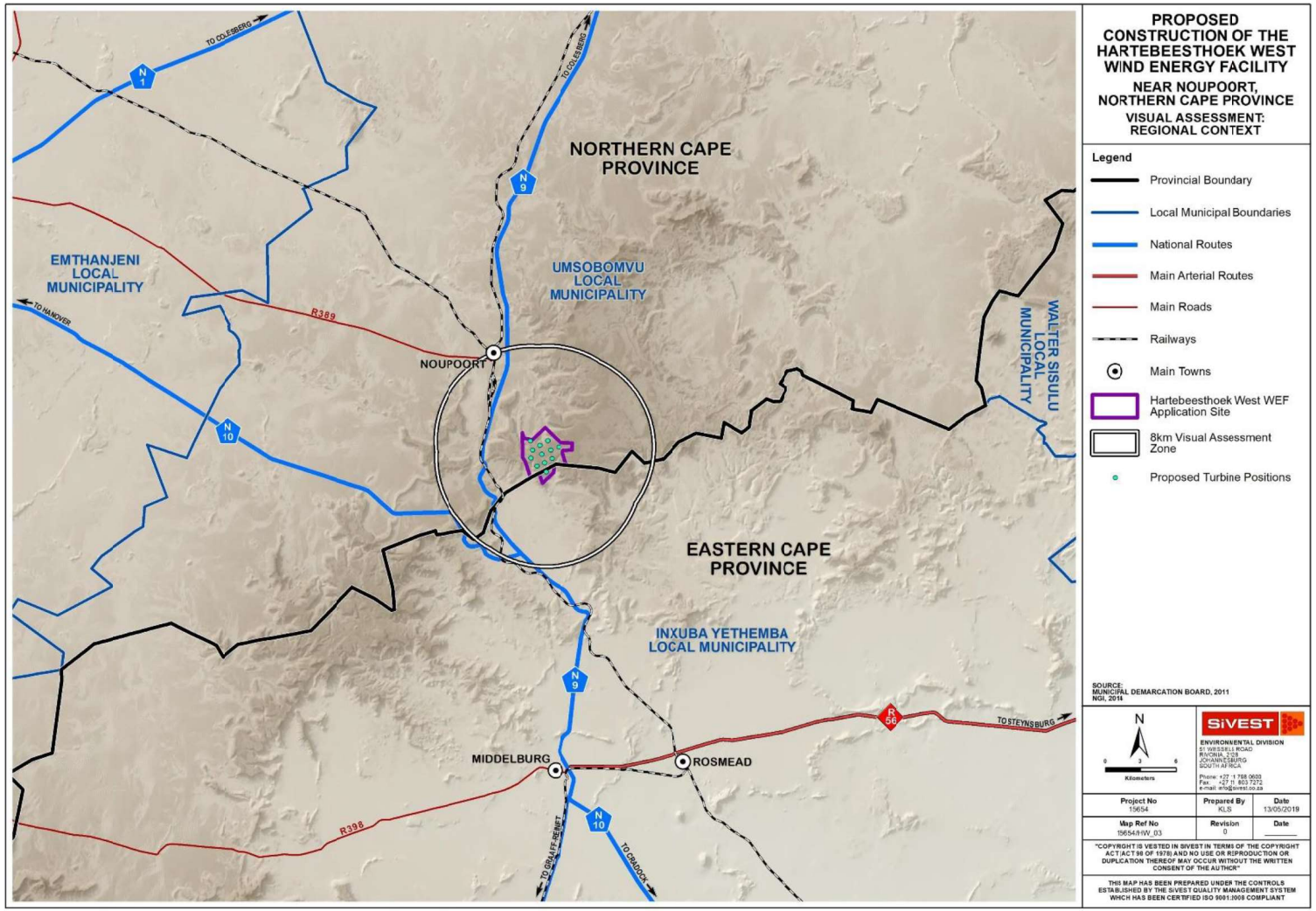


Figure 5: Regional Context

1.3 Assumptions and Limitations

- Given the fact that the proposed Hartebeesthoek West WEF is within the project area already assessed for the Phezukomoya WEF, it has been assumed that the baseline conditions in the area remain largely unchanged. As such, baseline information used in this VIA is largely drawn from the original VIA and no further fieldwork was undertaken as part of this VIA.

- Visual receptors identified for the original VIA will be used to inform this new VIA. Identification of visual receptors for the Phezukomoya WEF was based on a combination of desktop assessment as well as field-based observation. 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 11th and the 14th of September 2017. Due to the extent of the study area, however, and the fact that many of the identified receptors are farmhouses on private property, it was not possible to visit or verify every potentially sensitive visual receptor location. As such, a number of broad assumptions were made in terms of the likely sensitivity of the receptors to the proposed development. It should be noted that not all receptor locations 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.

- During the site visit, it was observed that a few of the farmsteads identified via desktop means (i.e. Google Earth) had been abandoned. As such, these were eliminated from the list of potentially sensitive receptor locations for the purpose of the original EIA phase study.

- Some receptors identified during the original VIA were found to be farmsteads on properties which form part of the proposed development and as such the owners of these properties would benefit financially from the proposed development. Some of these farmsteads would therefore not be visually sensitive to the proposed WEF and were eliminated from the list of potentially sensitive receptor locations. Farmsteads were not however eliminated from the list of potentially sensitive receptor locations in cases where they are still currently occupied, and the owners or tenants could still perceive the proposed WEF in a negative light. These receptors are thus still regarded as potentially sensitive visual receptor locations.

- As previously stated, it was not possible to visit or verify every potentially sensitive visual receptor location during the time of the site visit. As such, the impact rating assessment of the proposed development on these receptor locations was undertaken primarily via desktop means. Although the use of all of these farmsteads dwellings could not be established during the field investigation, they were still regarded as being potentially sensitive to the visual impacts associated with the proposed WEF and were assessed as part of the VIA.

- Wind turbines are very large structures by nature and could impact on receptors that are located relatively far away, particularly in areas with very flat terrain. 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 a zone of 8km from the proposed Hartebeesthoek West WEF – i.e. an area of 8km from the proposed turbine locations. 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 8km, 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.

- Given the reduced number of turbines proposed for the Hartebeesthoek West WEF, and the new turbine placements, only those receptors within the 8km visual assessment zone have been assessed in this new VIA.

- For the purposes of this study, all analysis is based on a worst case scenario where the structure height has been assumed to be 225m (tip height).

- No visual modelling was undertaken for the new turbine layout proposed for the Hartebeesthoek West WEF. Photomontages prepared for the original Phezukomoya WEF VIA have however been included where relevant merely to provide indicative illustrations.

- 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 generate the viewsheds.

- A viewshed analysis was undertaken for the proposed Hartebeesthoek West WEF based on the new layout provided. The viewshed analysis incorporated all 12 turbines and assumed a worst-case scenario, in which the wind turbines would have a maximum height of 225m. Other infrastructure associated with the proposed WEF was not factored into the viewshed analysis. In addition, screening provided by any existing infrastructure and tall wooded vegetation were not factored into the analysis. It should be noted that detailed topographic data was not available for the entire study area and as such, the viewshed analysis does not take into account any localised topographic variations which may constrain views. The viewshed analysis should, therefore, be

seen as a conceptual representation or a worst-case scenario which rates the geographical area from where the proposed wind turbines could be visible.

- 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 WEF 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 merely as a representation of the likely visual impact at a receptor location.

- Given that the proposed Hartebeesthoek West WEF is within the project area previously assessed for the Phezukomoya WEF, the visual sensitivity analysis undertaken for the previous VIA has been used to inform this new VIA. This sensitivity analysis was based purely on topographic data available for the broader study area. Localised topographic variations, existing infrastructure and/or vegetation, which may constrain views were not factored into the analysis. In addition, the analysis does not take into account differing perceptions of the viewer, which largely determine the degree of visual impact being experienced. This sensitivity analysis should, therefore, be seen as a conceptual representation or a worst-case scenario which rates the visibility of the site in relation to potentially sensitive receptors.

- No feedback regarding the amended proposals for the Hartebeesthoek West WEF has yet been received from the public participation process. However, any feedback from the public during the review period will be incorporated into further drafts of this report.

- At the time of undertaking the visual study, no information was available regarding the type and intensity of lighting that will be required for the proposed WEF and therefore 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 ambience 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.

- Most rainfall within the area occurs from February to March, during the late summer months. It should be noted that the fieldwork was undertaken in September 2017, during the early springtime when the surrounding vegetation is expected to provide less potential screening than in the late summer months.

- The weather conditions in the study area also have certain visual implications and are expected to affect the visual impact of the proposed development to some degree. As mentioned above, the fieldwork was undertaken during the early spring, which is characterised by clear weather conditions. It should be noted that clear conditions would make the wind turbines appear to contrast more with the surrounding environment than they would on a cloudy overcast day. The weather conditions during the time of the study were, therefore taken into consideration when undertaking the impact rating for each identified potentially sensitive receptor location (**Section 7.2**).

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 (Scoping Phase) for the proposed development of the Paulputs WEF near Pofadder, Northern Cape Province. ▪ VIA (BA) for the proposed development of the 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 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 (Scoping Phase) for the proposed development of the Paulputs WEF near Pofadder, Northern Cape Province. ▪ VIA (BA) for the proposed development of the 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 B**.

1.5 Assessment Methodology

Baseline information for this VIA is largely drawn from the original VIA which was based on a desktop-level assessment supported by field-based observation.

1.5.1 Fieldwork and photographic review

Given that the proposed Hartebeesthoek West WEF is located within the project area already assessed for the original Phezukomya WEF, it was not considered necessary to undertake any additional fieldwork. Fieldwork undertaken for the Phezukomya VIA has therefore been used to inform this new VIA. This fieldwork involved a four (4) day site visit in September 2017 which served 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).

1.5.2 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 Phezukomoya WEF 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.

1.5.3 Identification of sensitive receptors

Sensitive visual receptor locations, such as guesthouses/guest farms and routes within the study area identified for the original Phezukomoya WEF VIA were re-assessed in order to determine the impact of the amended WEF proposals on each of the identified receptor locations.

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 (both sensitive and potentially sensitive), 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 Visualisation Modelling

Visual simulations/photomontages have not been produced for the amended layout for Hartebeesthoek West WEF. Photomontages produced for the Phezukomoya WEF VIA have however been included where relevant to provide indicative illustrations of wind turbines in the landscape.

1.5.6 Consultation with I&APs

No feedback regarding the amended proposals for the Hartebeesthoek West WEF has yet been received from the public participation process. However, any feedback from the public during the review period will be incorporated into further drafts of this report.

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 age, gender, activity preferences, time spent within the landscape and traditions of the viewer (Barthwal, 2002). This is important, as certain receptors may not consider a WEF to be a negative visual impact as it is often associated with employment creation, social upliftment and the general growth and progression of an area, and could even have positive connotations.

2.2 Visual environment

WEFs 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 objects 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, with the impact at 1 000m being considerably less than the impact at a distance of 500m. (**Figure 6**). Beyond 8000m, the impact would be negligible (Hull, R.B., et al: 1998).

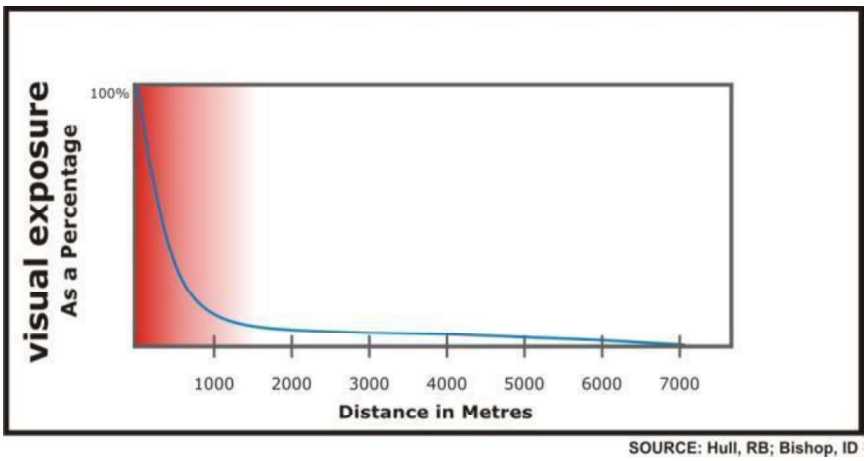


Figure 6: Conceptual representation of diminishing visual exposure over distance

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 topography in the wider study area around the site is characterised by a mix of very flat plains (typical of much of the Karoo), as well as areas of much greater relief, including isolated dolerite-capped “koppies” and hilly terrain (**Figure 7**). The town of Noupoort (on the north-western boundary of study area) is flanked by hills / “koppies” to the east (**Figure 8**), and the terrain across much of the eastern portion of the study area is generally characterised by a mix of incised valleys and flatter, higher-lying plateaus (**Figure 9**).

Maps showing the topography and slope within and in the immediate vicinity of the proposed application site are provided in **Figure 10** and **Figure 11**, respectively.

Figure 7: View of the topography within the wider study area for the proposed Hartebeesthoek West WEF showing the mix of very flat plains, as well as areas of much greater relief.

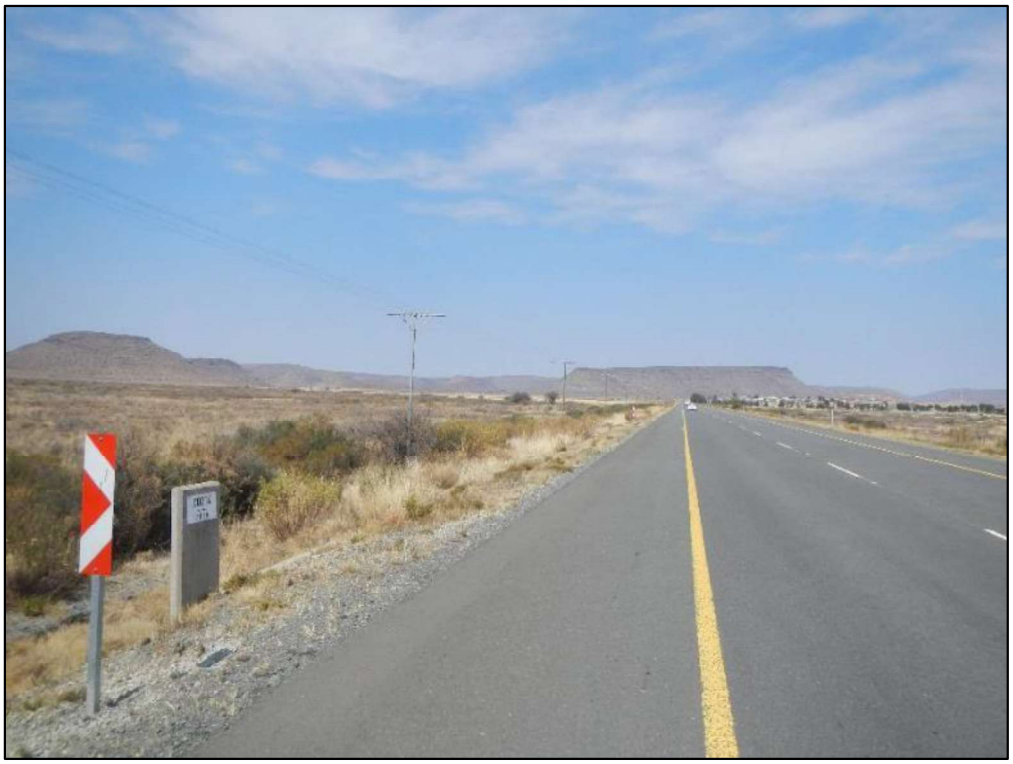


Figure 8: View of the town of Noupoort from the N9 national route showing the hills / "koppies" which flank the town to the east.

Figure 9: View of the terrain to the east of the town of Noupoort which is more hilly in character as a result of the more incised nature of the topography.

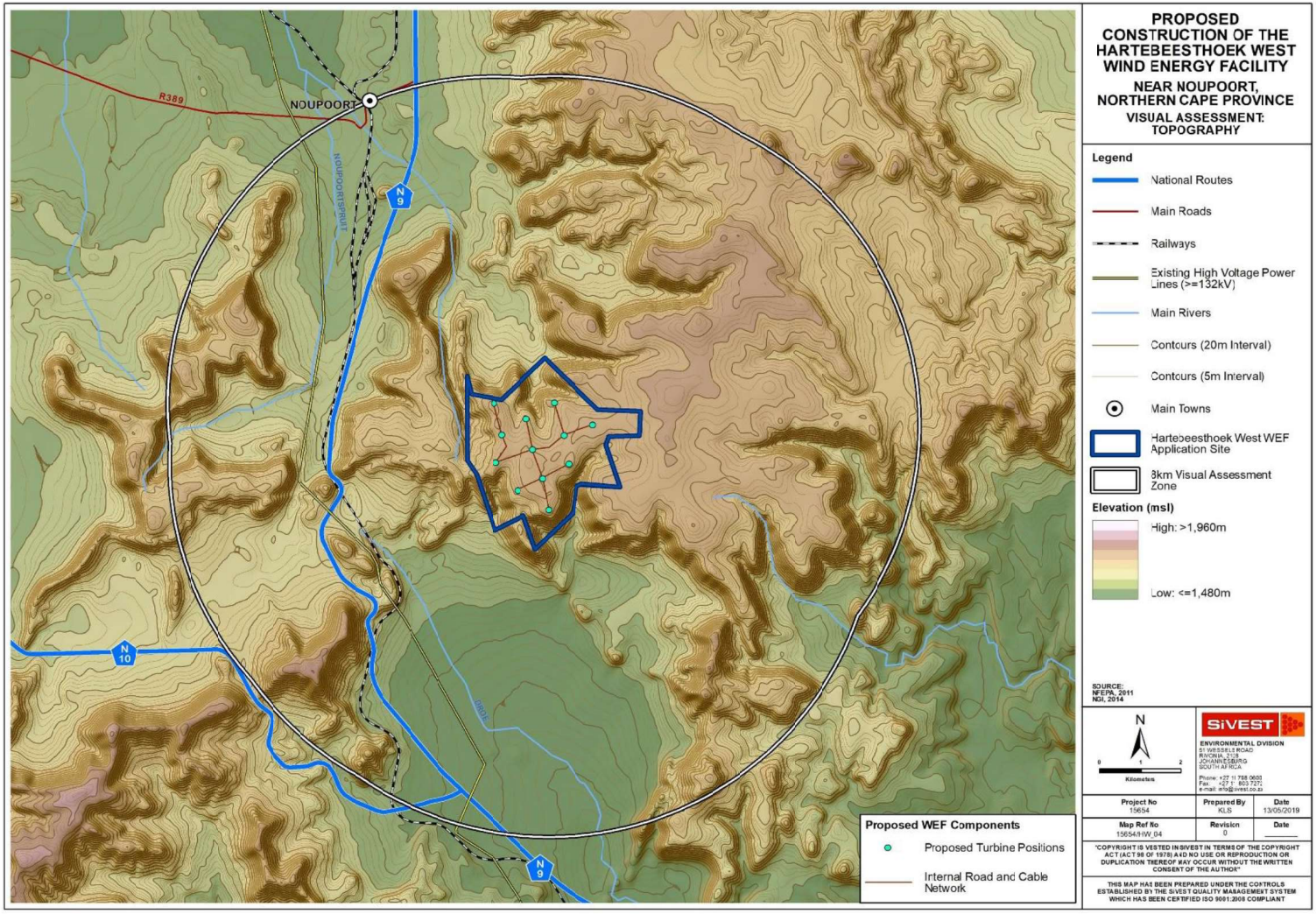


Figure 10: Topography in the study area

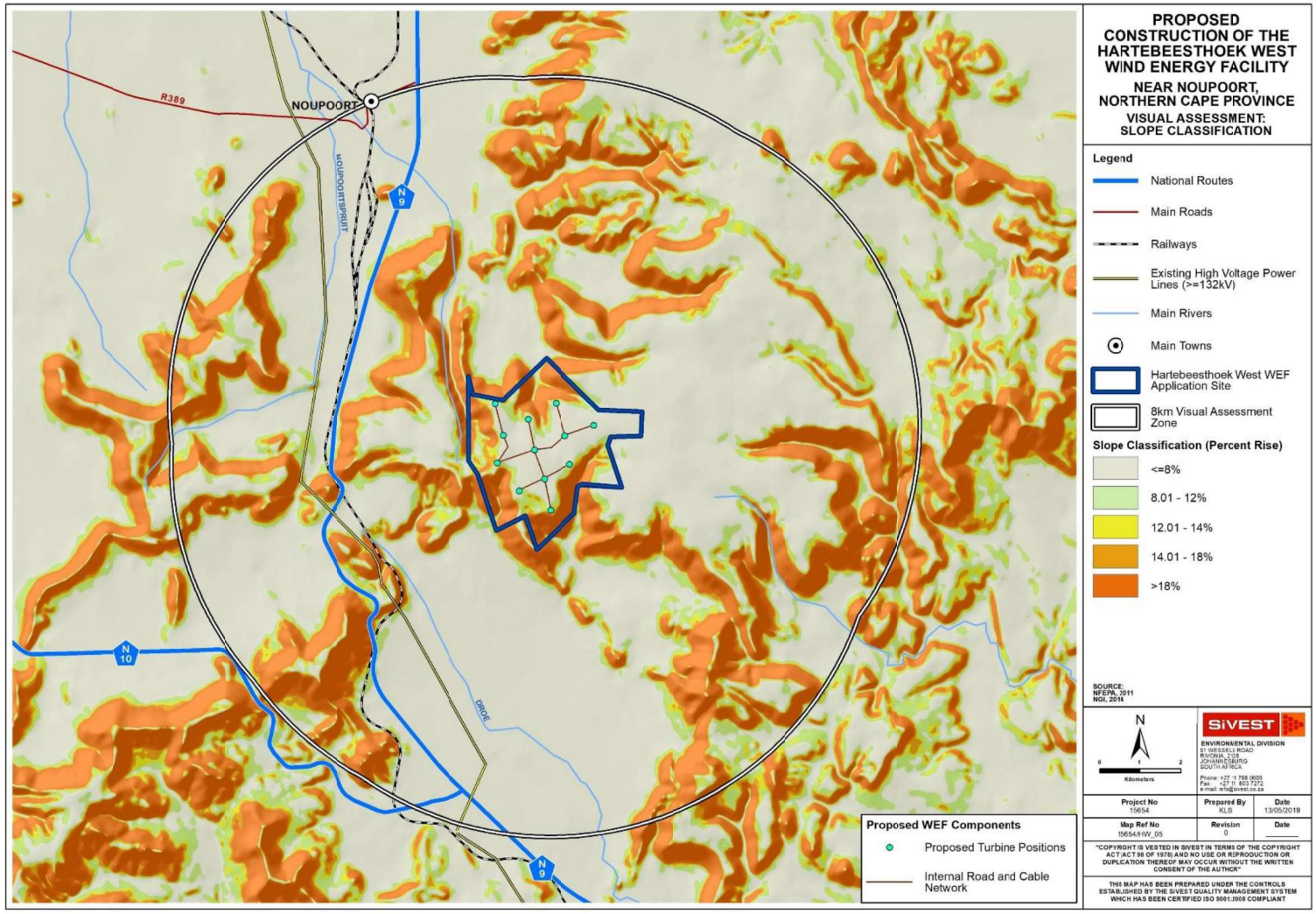


Figure 11: Slope classification

Visual Implications

The mixed nature of the terrain across the study area has differing visual implications. Areas of flat relief, such as the typical Karoo plains and the higher-lying grassy plateaus, are characterised by wide-ranging vistas (**Figure 12**), typically to the point at which surrounding hills / "koppies" enclose the visual envelope or local landscape (i.e. these hills form part of the horizon and areas beyond these hills cannot be seen). An example of this is seen from the town of Noupoort, where the hills that rise up from the plains to the east of the town frame the view, giving a relatively limited viewshed, whereas a much wider viewshed exists to the north of the town as the flat relief extends for quite a distance. Vistas in the hillier and higher-lying terrain can be more open or more enclosed, depending on the position of the viewer. Within some of the more incised valleys, the viewshed can be extremely limited (**Figure 13**), whereas from the higher-lying ridge tops or slopes, a much wider vista is available (**Figure 14**). Importantly in the context of this study, the same is true of objects placed at different elevations, with objects placed on high-elevation slopes or ridge tops being highly visible, and those placed within valleys or enclosed plateaus being visible from a much more restricted area.

Figure 12: View of an area of flat relief found within the study area which is characterised by wide-ranging vistas.

Figure 13: View from within an incised valley in the south-western section of the visual assessment zone which shows the limited viewshed from within this area.

Figure 14: View from a higher elevation within the study where a much wider vista is available.

GIS technology was used to undertake a viewshed analysis for the proposed 12 turbine layout for the Hartebeesthoek West WEF. The viewshed analysis incorporated all 12 turbines and assumed a

worst-case scenario, in which the wind turbines would have a maximum height of 225m. Other infrastructure associated with the proposed wind farm was not factored into the viewshed analysis as the impacts of the associated infrastructure is generally not regarded as a significant factor when compared to impacts associated with wind turbines. The resulting viewshed indicates the geographical area from where the wind turbines would be visible, i.e. the zone of visual influence. This analysis is based entirely on topography (relative elevation and aspect) and does not take into account any existing vegetation cover or built infrastructure, which may screen views of the proposed development. In addition, detailed topographic data was not available for the broader study area, and as such, the viewshed analysis does not take into account any localised topographic variations which may constrain views. This analysis should, therefore, be seen as a conceptual representation or a worst case scenario.

A map showing the potential visual influence of the proposed WEF has been provided in **Figure 15** below, and from this, it is evident that the turbines comprising the proposed Hartebeesthoek West WEF are located in areas of high visibility.

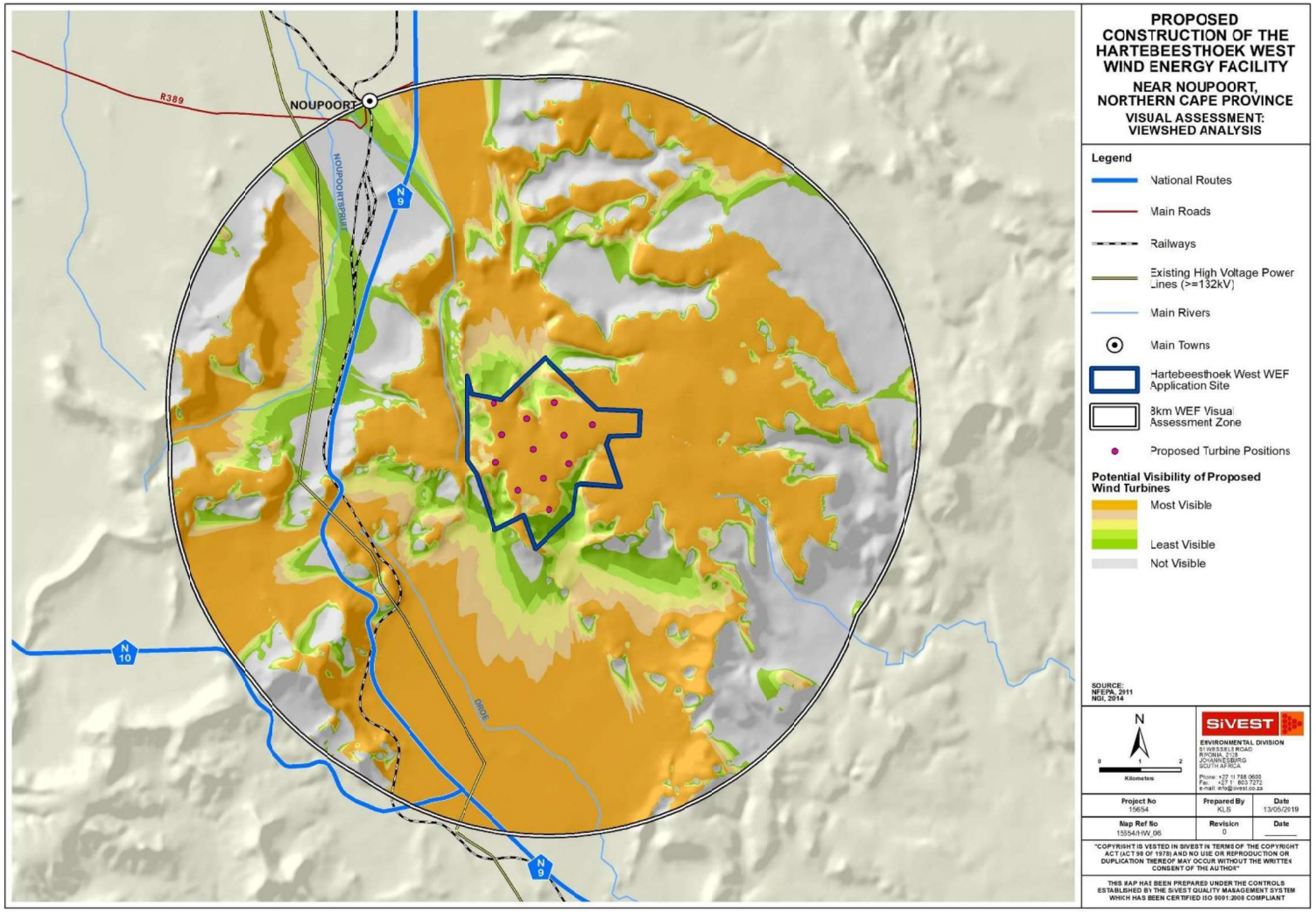


Figure 15: Map showing the potential visual influence of the proposed WEF based on the amended **turbine layout**

3.1.2 Vegetation

According to Mucina and Rutherford (2006), the areas of the visual assessment zone which are characterised by flatter Karoo plains are largely covered by the Eastern Upper Karoo vegetation type, while the hillier areas in the eastern sector of the study area are largely characterised by Karoo Escarpment **(Figure 19**). The aridity of the area has restricted the vegetation to low shrubs distributed uniformly across the landscape, except in areas of disturbance where patches of bare earth occur (**Figure 16**), although some tree species are present in certain parts of the study area (**Figure 17**). In certain areas, man has had an impact on the natural vegetation, especially around some farmsteads, where over many years, tall exotic trees and other typical garden vegetation have been established (**Figure 18**).

Figure 16: Typical vegetation cover found within the wider study.

Figure 17: Example of some of the tree species which can be found in parts of the study area.

Figure 18: Example of tall trees that have been established around a farmhouse in the area

Visual Implications

The natural short vegetation cover will offer no visual screening. Parts of the study area are however characterised by the presence of some tree species which occur naturally in these areas. These trees are expected to contribute to the overall natural character of the study area while also providing limited screening from the proposed development. In addition, tall exotic trees may be planted around farmhouses may effectively screen views of the proposed development from these dwellings.

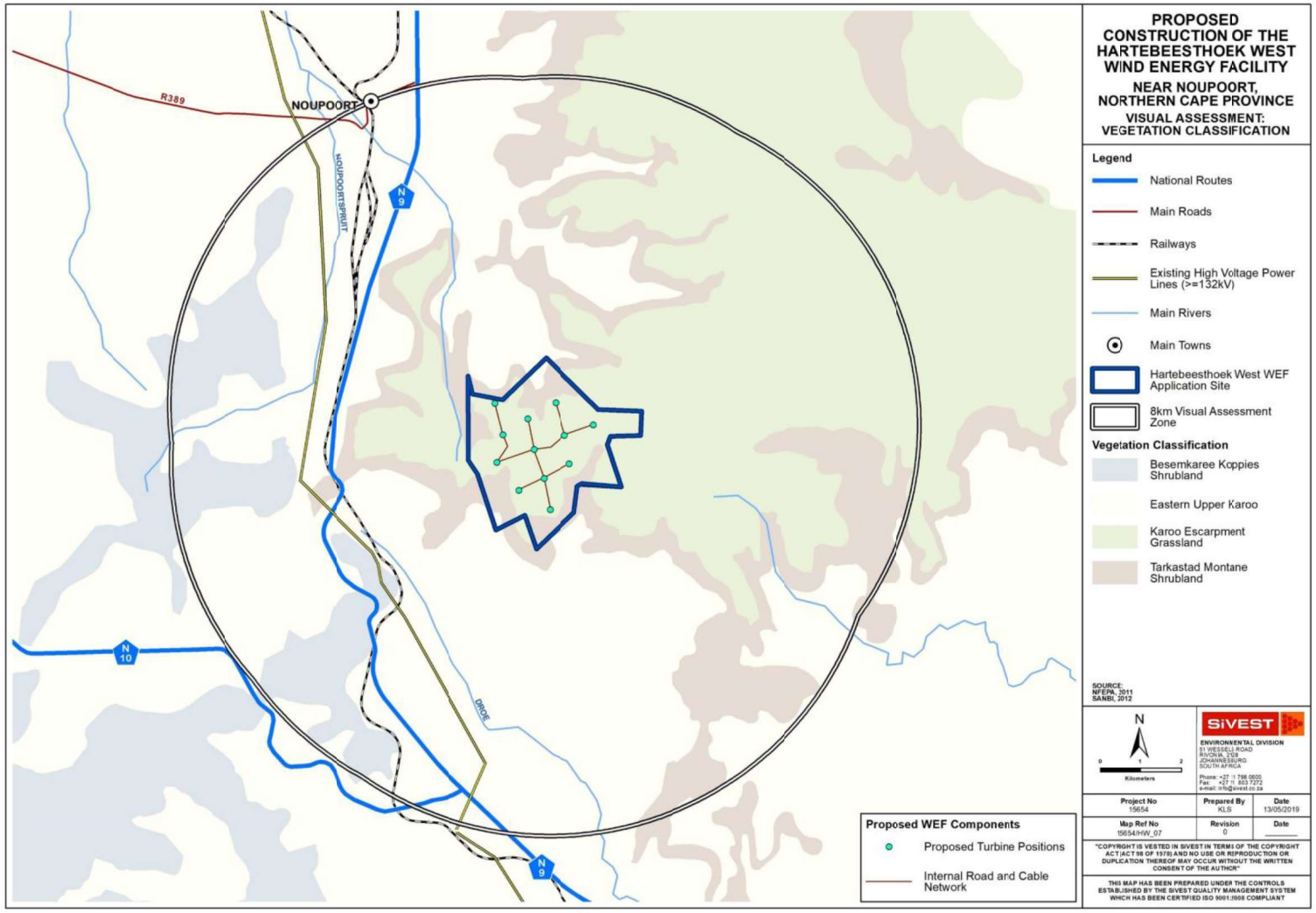


Figure 19: Vegetation classification map

3.1.3 Land Use

According to the South African National Land Cover dataset (2013-2014) from Geoterraimage (2014), much of the visual assessment area is characterised by natural unimproved vegetation which is dominated by low shrubland (**Figure 27**). The highly arid nature of the area's climate has resulted in livestock rearing being the dominant activity within the area (**Figure 20**). The nature of the climate and corresponding land use has also resulted in low stocking densities and relatively large farm properties across the area. Only very small areas along valley bottoms have been cultivated (**Figure 21**), and as such, the natural vegetation has been retained across much of the study area.

Figure 20: Typical view of the sheep farming activities which are dominant within the study area.

Figure 21: Typical view of a small patch of cultivated land.

Thus, the area has a very low density of rural settlement, with relatively few scattered farmsteads occurring across the area. Built form in the rural parts of the study area is limited to isolated farmsteads, gravel access roads, ancillary farm buildings, telephone lines, fences and the remnants of abandoned workers' dwellings.

It should be noted that the study area is also characterised by some pastoral elements such as livestock enclosures/camps and windmills etc. (**Figure 22**). These elements can be found throughout the study area and particularly in areas where livestock rearing and other agricultural activities are taking place.

Figure 22: Example of typical pastoral elements (such as livestock enclosures/camps and windmills) in parts of the study area.

The closest built-up area is the town of Noupoort, which is situated approximately 7km from the proposed development, on the north-western boundary of the study area (**Figure 23**). The western portion of the study area is traversed by the N9 national route (**Figure 24**) and a railway line (**Figure 25**), both running in a north-south direction. It should be noted that short sections of the N10 national route and the R389 gravel road are also in the study area, both running in an east-west direction.

Figure 23: View of the town of Noupoort. The wind turbines of the Noupoort Wind Farm are visible on the hills / “koppies” to the east of this town.

Figure 24: View of the N9 national route which traverses the study area.

Figure 25: View of the railway line which traverses the study area in a north-south direction.

It should also be noted that the newly constructed Noupoort Wind Farm is situated to the north of the Hartebeesthoek West WEF, partially inside the visual assessment zone. Comprising some 35 wind turbines with associated infrastructure, this development has significantly transformed the natural environment in this area and is highly visible from within the town of Noupoort as well as from other parts of the study area (**Figure 26**).

Figure 26: View of the wind turbines of the Noupoort Wind Farm from within the town of Noupoort.

Visual Implications

The nature of land use in the rural parts of the area has been largely responsible for the area retaining a largely natural or 'pastoral' character, as the natural vegetation has been retained for grazing and the areas have remained largely untransformed. The short, scrubby or grassy vegetation that occurs over the entire study area offers no visual screening in itself, and this terrain is the most important factor in limiting vistas. The only exception to this situation exists at local farmsteads where trees and shrubs that have been planted around the farmstead provide effective screening from the surrounding areas.

High levels of human transformation are however evident in the vicinity of the town of Noupoort and on the northern boundary of the study area where the Noupoort Wind Farm has been established.

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

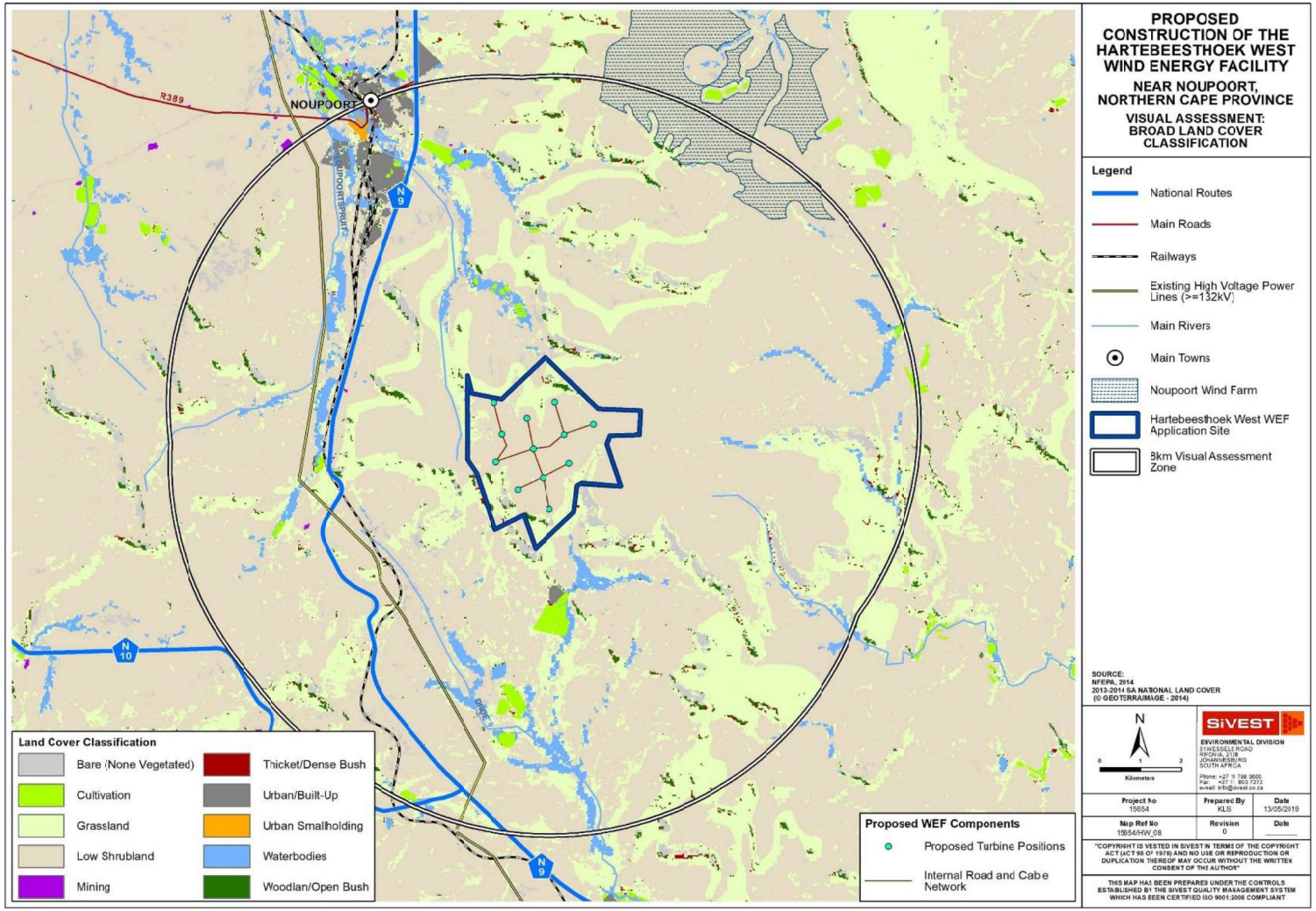


Figure 27: Land cover classification

3.2 Visual Character

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 elements 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.

Built form is largely dominated by isolated farmsteads, gravel access roads, telephone lines, low voltage power lines, fences and windmills, although the N9 national route, railway infrastructure and existing high voltage power lines form significant anthropogenic elements in the study area. The presence of this infrastructure is an important factor in this context, as the introduction of a development such as a 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.

Divergence from the above-mentioned rural character, however, occurs in the area around the town of Noupoort. Although it is a small town, Noupoort has a concentration of housing and other buildings such as schools, hospitals and churches, as well as relatively large railway shunting yards to distinguish it from the surrounding rural landscape. The town thus has a distinctly urban visual character (**Figure 28**).

Figure 28: View from within the town of Noupoort showing the urban visual character.

Significant transformation is also evident in the north-eastern sector of the study area, where the newly established Noupoort Wind Farm has introduced a more industrial-type visual character (**Figure 29**). The turbines of the Noupoort Wind Farm can be seen from various parts of the study area and are highly visible from areas within the town of Noupoort and the northern sections of the N9 national route (**Figure 30**). The presence of these turbines has transformed the natural visual character of the northern parts of the study area to some degree. In addition, several other renewable energy facilities (solar and wind) are proposed within relatively close proximity to the proposed Hartebeesthoek West WEF, which will further alter the visual character and baseline in the study area once constructed.

Figure 29: View of Noupoort Wind Farm

Figure 30: View toward the Noupoort Wind Farm from the northern section of the N9 national route.

The scenic quality of the landscape is also an important factor that contributes to the visual character or inherent sense of place. Visual appeal is often associated with unique natural

features or distinct variations in form. As such, the hilly/mountainous terrain which occurs across the wider study would increase the scenic appeal of the 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 scattered farmsteads and small towns. Over the last couple of decades, an increasing number of tourism routes have been established in the Karoo and in a context of increasing urbanisation in South Africa's major centres, the Karoo is being marketed as an undisturbed getaway. 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):

i) "a landscape designed and created intentionally by man";
ii) an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape";
iii) 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 Karoo towns, such as Noupoort, engulfed by an otherwise rural 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 the context 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.

Much of the study area, as visible to the viewer, represents a typical Karoo cultural landscape. In light of this, it is important to assess whether the introduction of a WEF 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 relatively few tourism or nature-based leisure facilities in the study area. In addition, although the proposed development will be visible from the N9 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' 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 moderately-low visual sensitivity. 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 or leisure / nature-based tourism activities were identified in the study area, and relatively few sensitive or potentially sensitive receptors were found to be present. The area would still, however, be valued as a typical Karoo cultural landscape, and the scenic mountainous terrain would have some visual appeal.

As previously mentioned, the Noupoort Wind Farm is located to the north of the proposed Hartebeesthoek West WEF application site, and the presence of this wind farm reduces the visual sensitivity of the broader area.

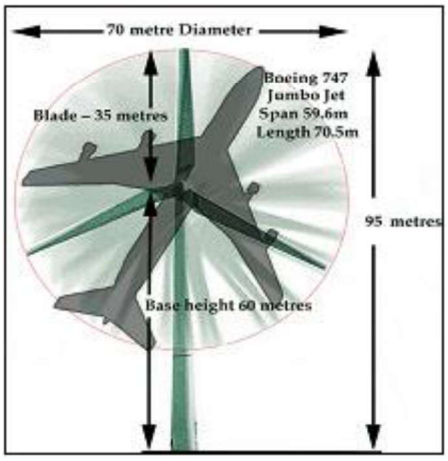
4 GENERIC VISUAL IMPACTS ASSOCIATED WITH THE WEF AND ASSOCIATED INFRASTRUCTURE

In this section, the typical visual issues/impacts related to the establishment of a WEF and associated infrastructure 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 solar energy facilities.

4.1 Wind Energy Facilities

As previously mentioned, the proposed Hartebeesthoek West project will comprise up to 12 wind turbines with a total generation capacity of approximately 74.4MW. The wind turbines will have a hub height of up to 137m and a rotor diameter of up to 175m (approximate in height to a building of 45 storeys). The height of the turbines and the fact that a WEF comprises a number of these 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 WEF, with less opposition being encountered when fewer turbines are proposed (Devine-Wright, 2005). Certain objectors to wind energy developments also mention the “sky space” occupied by the rotors of a turbine. As well as height, "sky space" is an important issue. “Sky space” refers to the area in which the rotors would rotate. The diagram below indicates that the “sky space” occupied by rotors would be similar to that occupied by a jumbo jet (http://www.stopbickertonwindturbines.co.uk/ - page on visual impact).



The visual prominence of the development would be exacerbated within natural settings, in areas of flat terrain or if located on a ridge top. Even dense stands of wooded vegetation are likely to offer only partial visual screening, as the wind turbines are of such a height that they will rise above even mature large trees.

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 rotor blades of the wind turbine rotate (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 rotor blades of the wind turbine. As such, shadow flicker is only expected to have an impact on 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 an impact on 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 the orientation of the turbines relative to the nearby houses and the latitude of the site into consideration. 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 rotor blades. 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 WEFs suggests that the viewing of moving rotor 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. The authors of the study 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.

4.2 Associated Infrastructure

On-site infrastructure associated with the proposed Hartebeesthoek West WEF will include the following:

- Internal roads between 8m and 14m.

- Medium voltage underground cables which will follow the alignment of the internal access roads.
- On-site switching station.
- Hardstand areas at the base of each turbine to accommodate the turbine base and crane pad.
- Operations and maintenance (O&M) buildings.
- Security lighting.

Surface clearance for access roads, hardstand areas and other infrastructural components may result in the increased visual prominence of these features, thus increasing the level of contrast with the surrounding landscape. Trenches dug for the underground cable (both during construction and post-construction once the trench has been back-filled) may become prominent if they create a linear feature that contrasts with the surrounding vegetation. 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 7.4**).

The visual impact of the on-site 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 receptor location is defined as a location from where receptors would potentially be adversely 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 undertaken 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/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 part of the public participation process.

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 would experience greater adverse visual impact than those located further away. Zones of visual impact for the WEF were therefore delineated based on distance bands measured from the turbine locations.

The degree of visual impact experienced will 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.

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

- 0 - 2km (high impact zone);
- 2 - 5km (moderate impact zone); and
- 5km - 8km (low impact zone).

The receptor database compiled for the original Phezukomoya WEF VIA was refined to identify only those receptors located within 8km of a wind turbine in the Hartebeesthoek West project area. Two (2) receptor locations were identified as being visually sensitive to the proposed development, these being the Dairy BnB (VR 28), and Carlton Heights Guest Lodge (VR36). These locations are regarded as sensitive visual receptors as they are used as tourism facilities and visitors to these facilities may perceive the proposed development in a negative light.

The Dairy Bed and Breakfast (VR 28) is situated approximately 2km outside of the town of Noupoort and is accessed via the N9 national route. It should be noted that this facility is situated approximately 6km from the nearest proposed turbine location in the amended Hartebeesthoek West layout and is thus located in a zone of low potential visual impact. As this facility is 5.1km from the nearest turbine in the approved layout, impacts arising from distance from/proximity to the development will be reduced as a result of the amended layout. This guesthouse (**Figure 31**), situated in a quiet farm setting, is frequently used as an overnight

stop-over by persons travelling along the N9 national route. In addition, the facility offers a range of activities and outdoor facilities, such as horse riding, cycling, hiking and a backpackers hostel (**Figure 32**). It should, however, be noted that according to the specialist who conducted the social impact assessment for the original Phezukomoya WEF project, the potential visual intrusion of the proposed WEF turbines was not identified as a concern by the owner of this facility (Annatjie van Huyssteen). It was, in fact, indicated that many visitors to this facility would consider the WEF to be a draw card (Barbour, T and van der Merwe, S., September 2017).

Figure 31: View of the main guesthouse facility at The Dairy BnB (VR 28).

Figure 32: View of the backpacker's accommodation facility at The Dairy BnB (VR 28)

This guesthouse is situated within a largely natural setting with some pastoral elements as well some anthropogenic elements such as low voltage power lines in evidence (**Figure 33**). Views from this receptor are thus considered to be mostly natural/scenic. There are also a significant number of screening factors (such as mountains and vegetation) surrounding this receptor, which are expected to block most views towards the proposed development (**Figure 34**). It should, however, be noted that the town of Noupoort is partially visible from this receptor, and this degrades the visual character of the area to some degree (**Figure 35**).

Figure 33: View of the typical pastoral elements and other anthropogenic elements (such as existing low voltage power lines) which are present at this receptor.

Figure 34: View towards the proposed Phezukomoya WEF Application Site from VR28.

Figure 35: View towards the town of Noupoort from VR 28.

Carlton Heights Lodge (VR 36) is situated approximately 16km south of Noupoort, 1.5km from the N9 national highway (**Figure 36**). It should be noted that this facility is situated approximately 5.8km from the nearest proposed turbine location in the amended Hartebeeshoek West layout and is thus located in a zone of low potential visual impact. As this facility is 5.1km from the nearest turbine in the approved layout, impacts arising from distance from/proximity to the development will be slightly reduced as a result of the amended turbine layout. Aside from accommodation facilities in a Karoo Style farmhouse (**Figure 37**), the lodge offers scenic views, walking opportunities, bird watching and game viewing opportunities as well as scenic 4x4 routes on the farm and a campsite.

Figure 36: View of the entrance of the Carlton Heights Lodge (VR 36).

Figure 37: View of the accommodation facilities (farmhouse) at the Carlton Heights Lodge (VR 36)

This guesthouse is situated within a largely natural or rural setting and as such views from this receptor are considered to be mostly natural and scenic (**Figure 38**) It should be noted that a

cluster of tall trees located to the north-east of the main guesthouse is expected to provide a moderate amount of screening, thus partially obscuring views towards the proposed development (**Figure 39**). This receptor is also characterised by the presence of anthropogenic elements such as existing power lines which are visible from this receptor (**Figure 40**).

Figure 38: Natural / scenic views from VR36

Figure 39: Tall trees which to the north-east of the main guesthouse which are expected to partially obscure views towards the proposed development.

Figure 40: View of the existing power lines from VR 36.

A total number of fourteen (14) potentially sensitive receptors were identified within the visual assessment zone of the proposed Hartebeesthoek West WEF, most of which appear to be

existing farmsteads or farmhouses. Six (6) of these receptor locations were found to be outside the viewshed for the Hartebeesthoek West turbine layout and were removed from the list of potentially sensitive receptors. The remaining eight (8) receptors inside the viewshed 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 dwellings.

In many cases, roads along which people travel, are regarded as sensitive receptors. The N9 national route traverses the study area in a north-south direction, passing through a very scenic area as it approaches the town of Noupoort, and can be considered to be the primary sensitive receptor road through the area. Proposed turbines for the Hartebeesthoek West WEF development are situated on higher-lying plateaus to the east of the N9, and these are likely to be highly visible to motorists travelling along this road. Other potentially sensitive receptor roads include the following:

- The N10 national route which passes through a small section of the study area in an east-west direction. This is a national route linking Port Elizabeth on the Eastern Cape coast with Upington and the Namibian border to the west. Turbines situated on higher-lying plateaus are likely to be visible to motorists travelling along this road.

- The R389 provincial (un-surfaced) road that runs from the town of Noupoort in a westerly direction providing a link to the N1 and the town of Hanover. It should, however, be noted that only a small section of this road lies in the northern part of the study area (near the town of Noupoort). In the setting of flat Karoo plains, turbines placed on the higher plateaus on the development site would be visible to motorists travelling along this road.

The sensitive and potentially sensitive visual receptor locations in relation to the zones of visual impact for the proposed WEF are indicated in **Figure 41** below.

It is important to note that none of the identified sensitive receptors and only one of the potentially sensitive receptor locations are in a zone of high potential visual impact.

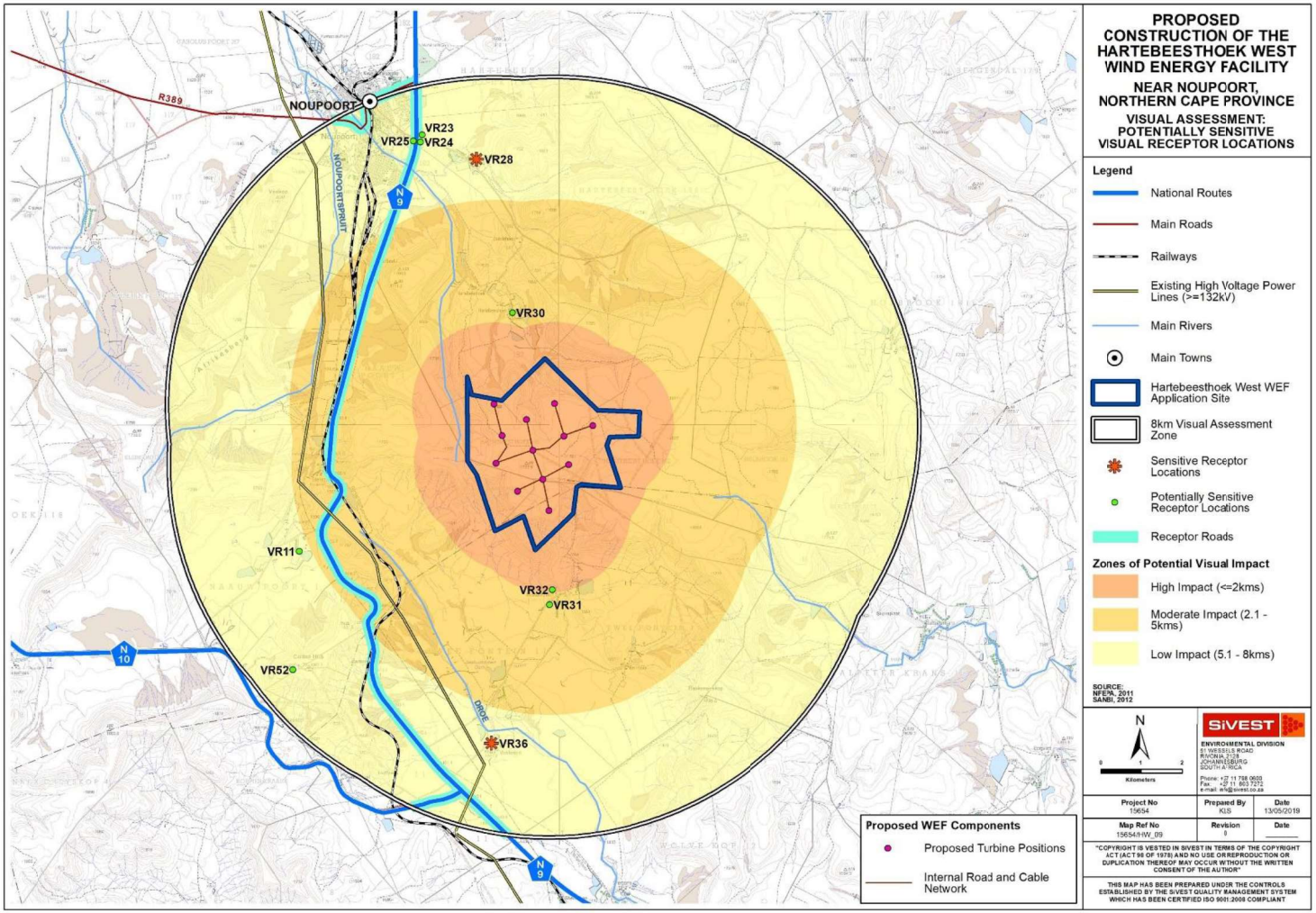


Figure 41: Sensitive and potentially sensitive visual receptors in the study area

6 VISUAL SENSITIVITY ANALYSIS

All specialists involved in the EIA process for the original Phezukomoya WEF were requested to indicate environmentally-sensitive areas within the development site. This exercise aimed 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 would result in the greatest probability of visual impacts on potentially sensitive visual receptors. Given that the proposed Hartebeesthoek West WEF is within the project area previously assessed for the Phezukomoya WEF, the visual sensitivity analysis undertaken for the previous VIA has been used to inform this new assessment.

As previously mentioned the visual prominence of a tall structure such as a wind turbine would be exacerbated if located on a ridge top or high lying plateau. Layout plans for the proposed development show that turbine placement is largely concentrated on the higher lying ridges and plateaus and as such the development is likely to be highly visible from much of the surrounding area. This does not necessarily mean that these plateaus should be precluded from any development and as such the original sensitivity analysis aimed to determine likely visual sensitivity in relation to the potentially sensitive receptor locations in the Phezukomoya WEF study area.

Using GIS-based visibility analysis, it was possible to determine which sectors of the Phezukomoya WEF site would be visible to the highest numbers of receptors in the study area. This analysis took into account all the potentially sensitive receptor locations identified within the original Phezukomoya WEF visual assessment zone as well as points along the receptor roads at 500m intervals. In the context of the smaller Hartebeesthoek West WEF project site, the results of the sensitivity analysis represent a worst case scenario as it incorporates receptor locations which are outside the amended 8km visual assessment zone.

Areas visible to the highest number of receptors were rated as 'medium-high sensitivity' and turbines should ideally be precluded from these areas in order to reduce the potential visual impact on the identified sensitive and potentially sensitive receptor locations. However, as the study area as a whole is rated as having a moderately-low visual sensitivity (refer to **Section 3.3**), these zones are not considered areas of high visual sensitivity or no go areas, but rather should be viewed as zones where the number of turbines should be limited, where possible as the turbines will still be highly visible. As all twelve (12) turbines comprising the Hartebeesthoek West WEF are located in the Medium Sensitivity zone, the proposed amended layout for the Hartebeesthoek West WEF is considered to be acceptable from a visual perspective.

The results of this analysis are shown in **Figure 42** below.

It should be noted that the visibility analysis is based purely on topographic data available for the broader study area and does not take into account any localised topographic variations or any existing infrastructure and/or vegetation which may constrain views. In addition, the

analysis does not take into account differing perceptions of the viewer, which largely determine the degree of visual impact being experienced.

The visual sensitivity analysis should, therefore, be seen as a conceptual representation or a worst-case scenario which rates the visibility of the site in relation to potentially sensitive receptors.

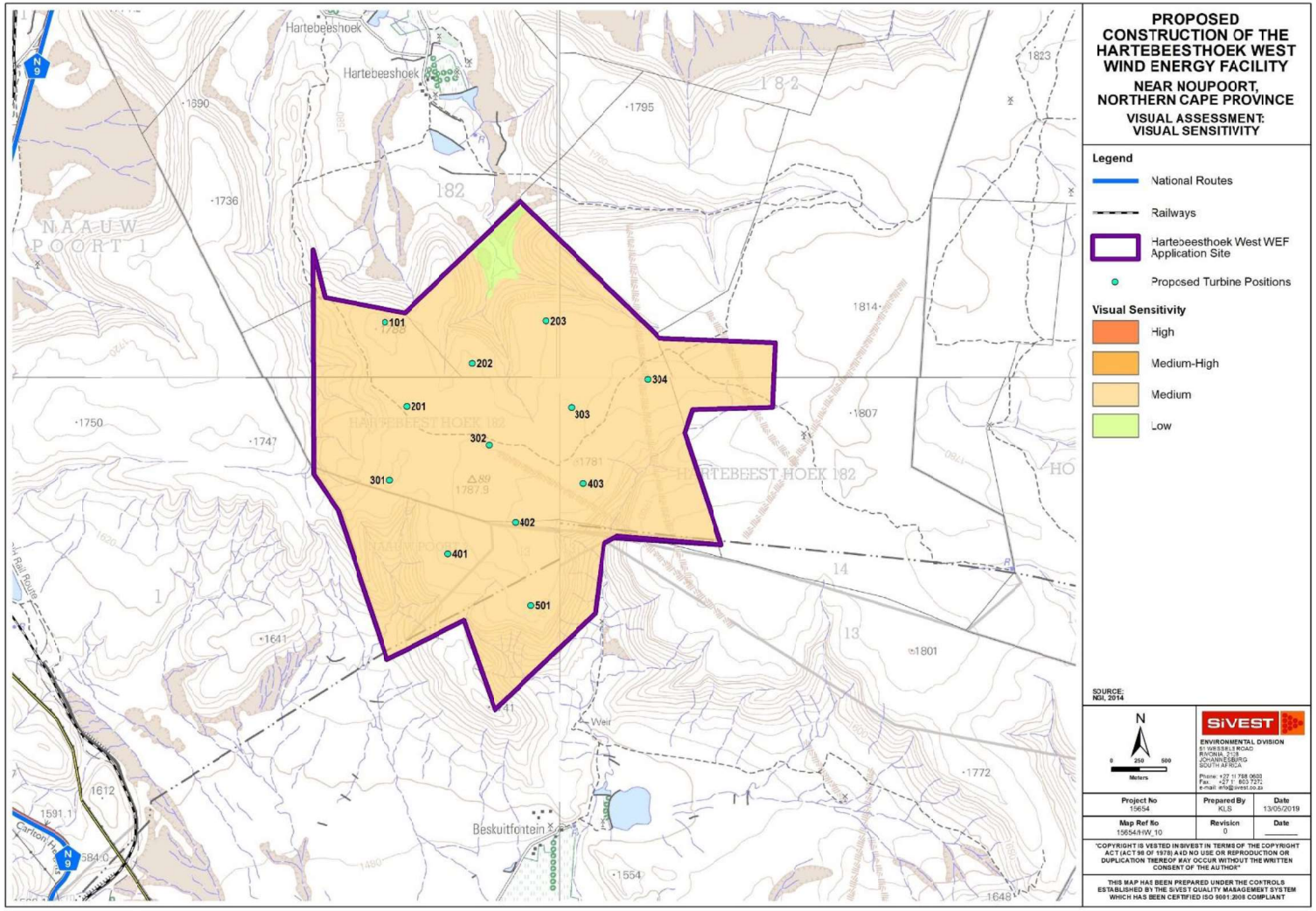


Figure 42: Visual sensitivity on the Hartebeesthoek West WEF application site.

7 IMPACT ASSESSMENT

7.1 Visual Compatibility / Contrast

The visual compatibility of the proposed development refers to 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, structural scale, form and pattern of elements that define the structure of the surrounding landscape. Visual compatibility is an important factor to be considered when assessing the impact of the development within a specific context. A development that is incongruent with the surrounding area may change the character of the landscape, which could have a significant visual impact from key scenic views within the study area. Where a development corresponds with the surrounding environment, the development would be easily absorbed by the surrounding environment and would result in little to no change in the visual character of the area.

In general, the proposed WEF development would not be consistent with the prevailing land uses within the wider study area. However, the anthropogenic elements and built-up areas present within parts of the study area are expected to partially alter the visual character and baseline, giving certain areas a more industrial visual character. This is particularly relevant for the north-western and northern sections of the visual assessment zone which are characterised by the presence of the town of Noupoort as well as the operational Noupoort Wind Farm. As such, the proposed development would increase the current level of visual transformation within the study area, but the existing anthropogenic forms will lessen the degree to which the proposed development would be considered incongruent with the surrounding landscape. In addition, the level of visual contrast would depend on the height, density and colour of the proposed development. If some or all of the other renewable energy facilities that are proposed within relatively close proximity to the proposed project are also constructed, the visual contrast would be significantly reduced as the proposed development would conform with the scale and form of these facilities.

7.2 Receptor Impact Rating

In order to assess the impact of the proposed development on the sensitive and potentially sensitive receptor locations listed above, 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 away from the proposed development (zones of visual impact);
- Presence of screening factors (topography, vegetation etc.); and
- 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.

7.2.1 Distance

As described above, the 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 development. Beyond 8km, the visual impact of a WEF diminishes considerably, as the development would appear to merge with the elements on the horizon.

7.2.2 Screening Factors

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.

7.2.3 Visual Contrast

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 level of visual contrast is determined as follows:

- **High –** undeveloped / natural / rural areas;

- **Moderate –** Intensive agricultural lands / cultivated fields or areas within close proximity (i.e. within approximately 500m) of the existing power line, road or rail infrastructure in undeveloped/natural/ rural areas; and
- **Low –** within approximately 1 km from visually transformed urban/built-up areas (such as the town of Noupoort) as well as any operational Renewable Energy Facilities (such as the operational Noupoort Wind Farm).

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

Table 2: Ratings 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**.

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

	VISUAL IMPACT RATING			
VISUAL FACTOR	**HIGH**	**MEDIUM**	**LOW**	**OVERRIDING FACTOR: NEGLIGIBLE**
Distance of receptor away from proposed development	0 ≤ 2km **Score 3**	2km ≤ 5km **Score 2**	5km ≤ 8km **Score 1**	8km <
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:** The development would contrast highly with the typical land use and/or pattern and form of human elements (infrastructural form). Typically a natural/pastoral environment with low-density rural infrastructure present (low voltage power lines and farm boundary fences). **Score: 3**	**Moderate:** The development would contrast moderately with the typical land use and/or pattern and form of human elements (infrastructural form) and existing level of visual transformation. Typically areas within close proximity to other prominent infrastructure (high voltage power lines and railway lines) and within intensive agricultural lands / cultivated fields. **Score: 2**	**Low:** The development would correspond with the typical land use and/or pattern and form of human elements (infrastructural form) and existing level of visual transformation. Presence of urban form and industrial-type infrastructure. The area is not highly valued or sensitive to change (e.g. outskirts of urban and built-up areas). **Score: 1**	

Table 4 below presents a summary of the overall visual impact of the proposed Hartebeesthoek West WEF development on each of the potentially sensitive visual receptor locations, which were 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: Visual impact of the proposed WEF development on sensitive and potentially sensitive visual receptors within the study area

Receptor Number	Distance to nearest turbine		Screening	Contrast	OVERALL IMPACT RATING
VR 28 – The Dairy BnBe	Low (1)	6.0km	Mod (2)	Mod (2)	**MODERATE (5)**
VR 36 – Carlton Heights Guest Lodge	Low (1)	5.8km	Mod (2)	Mod (2)	**MODERATE (5)**
VR 11 - Farmstead	Low (1)	5.3km	Low (1)	Mod (2)	**LOW (4)**
VR 23 - Farmstead	Low (1)	6.8km	Mod (2)	Low (1)	**LOW (4)**
VR 24 - Farmstead	Low (1)	6.7km	Mod (2)	Low (1)	**LOW (4)**
VR 25 - Farmstead	Low (1)	6.7km	Mod (2)	Low (1)	**LOW (4)**
VR 30 - Farmstead	Mod (2)	2.3km	Mod (2)	Mod (2)	**MODERATE (6)**
VR 31 - Farmstead	Mod (2)	2.3km	Low (1)	Mod (2)	**MODERATE (5)**
VR 32 - Farmstead	High (3)	1.9km	Mod (2)	Mod (2)	**MODERATE (7)**
VR52- Middelburg Hang-gliding	Low (1)	7.0km	Mod (2)	Mod (2)	**MODERATE (5)**

As indicated above, the two sensitive receptors identified (VR28 and VR 36) are expected to experience moderate levels of visual impact as a result of the proposed Phezukomya Split 1 WEF development. Moderate levels of visual impact are also expected to be experienced by four (4) potentially sensitive receptors, while the remaining four (4) receptors will experience low levels of visual impact.

7.3 Visual Simulations

As previously stated, visual simulations/photomontages have not been produced for the amended layout for Hartebeesthoek West WEF. Selected photomontages produced for the original Phezukomoya WEF VIA have however been included to provide indicative illustrations.

The photomontages below provide an indication of what wind turbines could look like from a range of locations within the study area. The models illustrate how views from each vantage

point could be transformed by the development of wind turbines on the higher-lying plateaus as proposed

As mentioned above, the following assumptions and limitations are of relevance for the visual models:

- The visual simulations represent a visual environment that assumes all vegetative clearing will be restored to its current state after the construction phase. This is, however, an improbable scenario as some trees and shrubs may be removed, which may reduce the accuracy of the models generated.

- The visual simulations included here were based on turbine layouts provided for the original Phezukomoya WEF. Although the turbine specifications have changed in respect of the amended layout, the overall height (i.e. ground to blade tip) used in the original simulations remains the same (225m). The amendments to the turbine placements for the proposed Hartebeeshoek West project have however changed, and as such and as such, the photomontages cannot be seen as representations of the new turbine layout proposals.

7.3.1 View from Zone of High Visual Impact

This viewing point is inside the application site area, approximately 1.2kms from the nearest turbine.

As indicated in **Figure 44**, wind turbines would be highly visible from this distance, especially where there are no significant screening factors.

Figure 43: Existing view (to the north-east) from inside the proposed Phezukomoya application site, approximately 1.8km from the nearest proposed turbine location.

Figure 44: Post-construction view (to the north-east) from inside the proposed Phezukomoya application site, approximately 1.2km from the nearest proposed turbine location.

7.3.2 View from Zone of Moderate Visual Impact

This viewing point is to the west of the Phezukomya WEF application site and approximately 4.9kms from the nearest turbine location. As indicated in **Figure 46**, with little topographic or vegetation screening present in the landscape, the wind turbines located on the high-lying plateaus would be clearly visible from this distance.

Figure 45: Existing view (to the east) towards the proposed Phezukomoya WEF turbine locations, approximately 4.9km from the nearest proposed turbine location.

Figure 46: Post-construction view (to the east) towards the proposed Phezukomoya WEF turbine locations, approximately 4.9km from the nearest proposed turbine location.

7.4 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 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 WEF at night.

Much of the study area is characterised by natural areas with pastoral elements and low densities of human settlement. As a result, relatively few light sources are present in the broader area surrounding the proposed development site. At night, the general study area is characterised by a picturesque dark starry sky, 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 cars travelling along the N9 and N10 national routes.

The closest built-up area is the town of Noupoort which is situated some 7kms from the application site. The town is the main source of light within the surrounding area, but given its

location in the north-western sector of the study area, light impacts are expected to be limited to areas within close proximity of the town.

Other prominent light sources affecting the study area at night include the operational and security lighting at the Noupoort Wind Farm located to the north of the WEF application site. In addition, permanent aviation lights or hazard lights placed on top of each wind turbine create a network of red lights in the dark night-time sky. As such, the northern sections of the study area have already seen some form of disturbance of the night environment. The night scene in these northern areas is thus not expected to be significantly impacted by the presence of the proposed WEF.

Given the scale of the proposed WEF, the operational and security lighting required for the 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.

7.5 Cumulative Impacts

Although it is important to assess the visual impacts of the proposed WEF 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 developed, 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.

Eighteen (18) renewable energy projects were identified within a 35 km radius of the proposed Hartebeesthoek West WEF (**Figure 47**), including the approved Phezukomoya WEF. These projects, as listed in **Table 5** below, were identified using the DEA's Renewable Energy EIA Application Database for SA in conjunction with information provided by Independent Power Producers operating in the broader region. 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.

The relatively large number of renewable energy facilities within the surrounding area and their potential for large scale visual impacts could significantly alter the sense of place and visual

character in the broader region, as well as exacerbate the visual impacts on surrounding visual receptors, once constructed.

Table 5: Renewable energy developments proposed within a 35km radius of the proposed Hartebeesthoek West WEF

Project	DEA Reference No	Technology	Capacity	Status of Application / Development
Aggenys SEF	14/12/16/3/3/1/530	Solar	20MW	Approved
Allemans Fontein SEF	14/12/16/3/3/1/730	Solar	20MW	Approved
Carolus Poort SEF	14/12/16/3/3/1/729	Solar	20MW	Approved
Collett SEF	14/12/16/3/3/2/385	Solar	20MW	Approved
Damfontein SEF	14/12/16/3/3/1/728	Solar	20MW	Approved
Dida SEF	14/12/16/3/3/1/530	Solar	20MW	Approved
Gillmer SEF	14/12/16/3/3/1/735	Solar	20MW	Approved
Inkululeko SEF	14/12/16/3/3/1/553	Solar	20MW	Approved
Kleinfontein SEF	12/12/20/2654	Solar	20MW	Approved
Klip Gat SEF	14/12/16/3/3/2/354	Solar	75M	Approved
Middelburg Solar Park 1	12/12/20/2465/2	Solar	75MW	Approved
Middelburg Solar Park 2	12/12/20/2465/1	Solar	75MW	Approved
Naauw Poort SEF	14/12/16/3/3/2/355	Solar	75MW	Approved
Toitdale SEF	12/12/20/2653	Solar	20MW	Approved
Noupoort Wind Farm	12/12/20/2319	Wind	188MW	In Operation
Phezukomoya WEF	14/12/16/3/3/1/1028	Wind	315MW	Approved
San Kraal WEF	14/12/16/3/3/1/1069	Wind	390MW	Approved
Umsobomvu WEF	14/12/16/3/3/2/730	Wind	140MW	Approved

As can be seen from this table, fourteen (14) of these projects are Solar Energy facilities (SEFs), ten (10) of which are located more than 8kms from the application site. Given the distance from the study area and the concentration of these facilities in close proximity to existing built infrastructure, 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 for the proposed Hartebeesthoek West project. It should be noted that although all of these SEF applications were approved at least five years ago, to date none have been constructed.

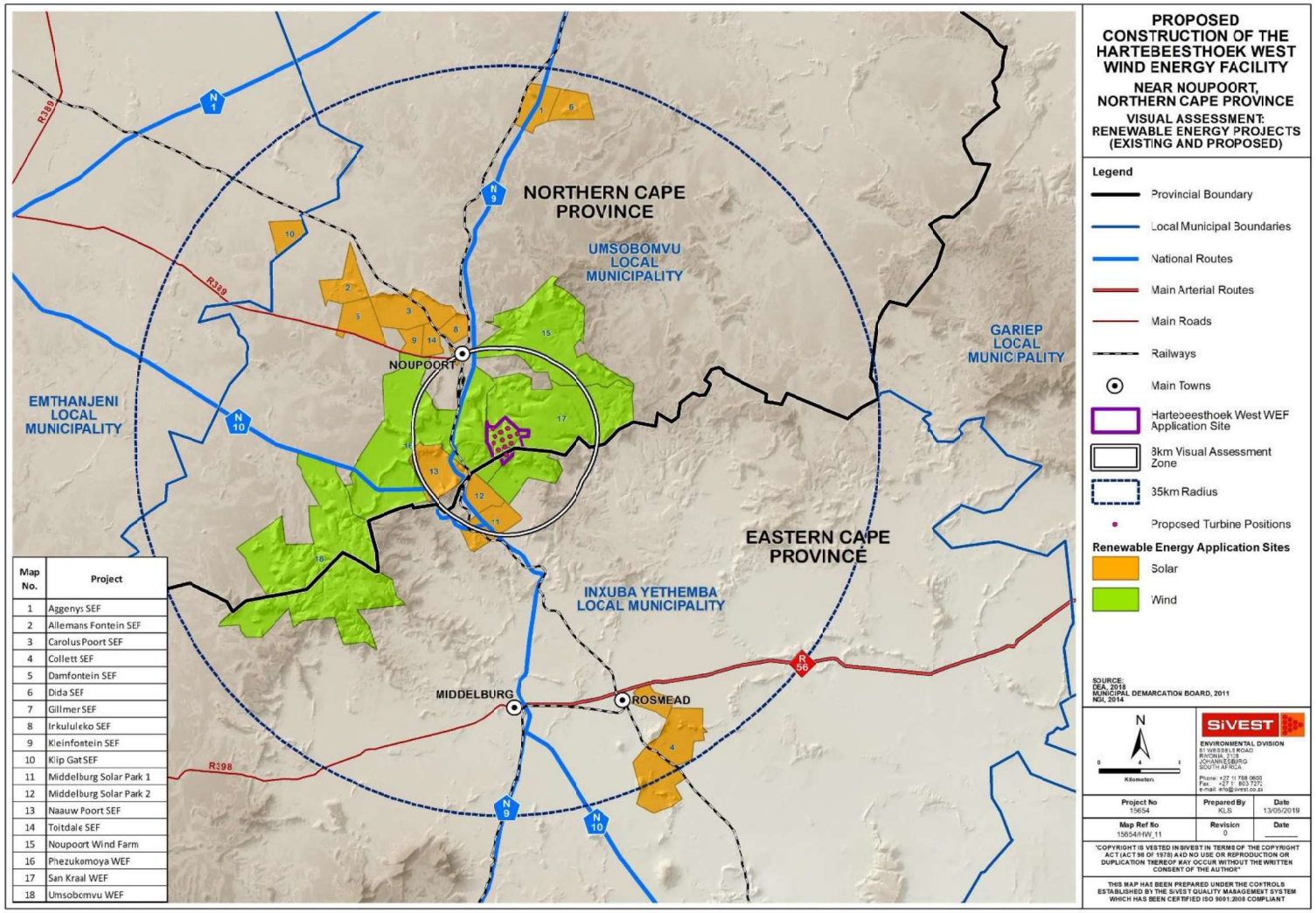
The remaining three (3) SEF projects, namely Middelburg Solar 1 and 2 and Naauwpoort SEF are all located at the south-western edge of the visual assessment zone for the Hartebeesthoek West WEF. Also lying in close proximity to the project site is the proposed San Kraal WEF as

well as the remaining area of the approved Phezukomoya WEF. Umsombomvu WEF is, however, outside the visual assessment zone for the Hartebeeshoek West WEF.

It is understood that most of the proposed turbines on the WEF development sites will be located on high-lying plateaus and ridges and as such they will be visible to many of the visual receptors in the assessment area.
These proposed WEFs, in conjunction with the three proposed solar PV facilities and associated grid connection infrastructure, will inevitably introduce an increasingly industrial character into a largely natural, pastoral landscape, thus giving rise to significant cumulative impacts. It should be noted however that PV panels, at an approximate height of 4m, are considerably less visible than wind turbines and as such the proposed solar PV facilities would be outside the viewshed of many 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.

A cursory examination of the literature available for the environmental assessments undertaken for many of these renewable energy applications showed that the visual impacts identified and the recommendations and mitigation measures provided are consistent with those identified in this report.

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 the broader area, and resulting in 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.



Map No.	Project
1	Aggeny SEF
2	Allemans Fontein SEF
3	Carolus Poort SEF
4	Collett SEF
5	Damfontein SEF
6	Dida SEF
7	Gillmer SEF
8	Irkululeko SEF
9	Kleinfontein SEF
10	Klip Gat SEF
11	Middelburg Solar Park 1
12	Middelburg Solar Park 2
13	Naauw Poort SEF
14	Toitdale SEF
15	Noupoort Wind Farm
16	Phezukomoya WEF
17	San Kraal WEF
18	Umsobomvu WEF

Figure 47: Renewable energy facilities proposed within a 35km radius of the Hartebeesthoek West WEF

7.6 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 impact rating assessment conducted for the original Phezukomoya WEF has been reviewed in light of the amended proposals for the proposed Hartebeesthoek West WEF. Although the impacts and associated ratings largely remain the same, revised impact rating tables have been included below.

7.6.1 Construction

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

Impact Phase:							
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 minimise 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.

Residual impact	YES - mitigation measures can reduce impacts

Table 7: Rating of visual impacts of the on-site infrastructure associated with the Hartebeesthoek West WEF during construction (including access roads and cabling)

Impact Phase:							
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 minimise 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.

Residual impact	YES – mitigation measures can reduce impacts

Table 8: Rating of cumulative visual impacts as a result of nearby renewable energy developments (including associated infrastructure) during construction

Impact Phase:							
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	H	Negative	M	H	M
With Mitigation	M	M	M	Negative	M	M	M
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 significant 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 minimise 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.

Residual impact	YES - mitigation measures can reduce impacts

7.6.2 Operation

Table 9: Rating of visual impacts of the proposed Hartebeestoek West WEF during operation

Impact Phase:							
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 nighttime 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 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: ▪ Medium-high visual impact zones should be viewed as zones where the number of turbines should be limited, where possible. ▪ No turbines should be placed within 500m of the N9 national route. ▪ 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.	
Residual impact	YES - mitigation measures can reduce impacts

Table 10: Rating of visual impacts of the on-site infrastructure associated with the Hartebeesthoek West WEF during operation (including access roads and cabling)

Impact Phase:							
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 nighttime visual environment could be altered by operational and security lighting emanating from buildings on the site.							
	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 and power lines and other infrastructure 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: ▪ 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	
Residual impact	YES - mitigation measures can reduce impacts

Table 11: Rating of cumulative visual impacts as a result of nearby renewable energy developments (including associated infrastructure) during operation

Impact Phase:							
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 nighttime 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	H	M
With Mitigation	M	M	M	Negative	M	M	M
Can the impact be reversed?	YES – if the WEF and power lines and other infrastructure 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. ▪ Medium-high visual impact zones should be viewed as zones where the number of turbines should be limited, where possible. ▪ Light fittings for security at night should reflect the light toward the ground (except for aviation lighting) and prevent light spill. ▪ The operations and maintenance buildings should not be illuminated at night, if possible.							

▪ Turbines should be painted plain white, as this is a less industrial colour (Vissering, 2011). Bright colours or obvious logos should not be permitted. ▪ Turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011). ▪ 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. ▪ If required, turbines 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). ▪ As far as possible, limit the number of maintenance vehicles, which are allowed to access the sites. ▪ Bury cables under the ground where possible. ▪ Ensure that dust suppression techniques are implemented on all access roads. ▪ Select the alternatives that will have the least impact on visual receptors. ▪ It is not realistic to attempt to screen wind farms visually. Providing a means whereby they can be absorbed into the landscape is more feasible. This can be approached by making use of certain materials and finishes and by presenting the scheme to I&APs. ▪ Institute a rigorous planting regime along sections of the project boundaries and along major transportation routes. Buildings and similar structures must be in keeping with regional planning policy, especially the principles of critical regionalism (namely sense of place, sense of history, sense of nature, sense of craft and sense of limits).	
Residual impact	YES - mitigation measures can reduce impacts

7.6.3 Decommissioning

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

8 ADVANTAGES / DISADVANTAGES OF PROPOSED CHANGES

In the case of an amendment application, the EIA Regulations, 2014 (as amended) require an assessment of the likely advantages or disadvantages of the proposed changes from a visual perspective.

The main advantage of the new proposals is a reduced number of turbines in this sector of the original Phezukomoya WEF as this will reduce visual impacts affecting the identified sensitive and potentially sensitive receptors. Although some of these receptors may still be affected by turbine development in the remaining sector of the Phezukomoya WEF site, the proposed amended layouts for Phezukomya Split 1 also comprise a reduced number of turbines which will further reduce the impacts on the receptors.

Changes in turbine specifications as proposed have no impact on the findings of this report as the new turbine heights are still within the limits assumed in original VIA (225m tip height).

A marginal disadvantage could possibly arise from the split of the authorised Phezukomoya WEF if the two projects are not constructed concurrently as prolonged construction periods would exacerbate visual impacts associated with construction.

9 CONCLUSION

The DEA granted environmental authorisation (EA) on 28th June 2018 for the proposed construction of the 275MW Phezukomoya Wind Energy Facility (WEF) with associated grid connection infrastructure near Noupoort in the Northern Cape Province. Subsequent proposals to split the approved Phezukomoya WEF project into two separate projects have necessitated a Part 2 Amendment application. Accordingly, this report serves to amend and update the EIA level visual study that was conducted for the Phezukomoya WEF in 2017 and assesses the proposed changes to the authorised WEF layout in respect of the smaller WEF project, now known as Hartebeesthoek West WEF.

Drawing on baseline information contained in the original Phezukomoya WEF VIA, the aim of this study is to assess the magnitude and significance of the visual impacts associated with the development of the proposed Hartebeesthoek West WEF. 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 developments 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 town of Noupoort, the N9 and N10 national routes, railway lines and existing high voltage power lines and the Noupoort Wind Farm on the northern boundary of the study area.

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. A total of fourteen (14) potentially sensitive receptors were identified in the study area, only two (2) of which are considered to be sensitive receptors as they are linked to tourism activities in the area. None of the receptors are however expected to experience high levels of visual impact from the proposed WEF facility, and although the N9, N10 and R389 receptor roads traverse the study area, motorists travelling along these routes are only expected to experience moderate impacts from the proposed Hartebeest West WEF.

An overall impact rating was also conducted to allow the visual impact to be assessed alongside other environmental parameters. The assessment revealed that impacts associated with the proposed Hartebeesthoek West WEF would be of moderate significance during both construction and decommissioning phases. 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 during operation would be of low significance,

Although eighteen (18) other renewable energy developments and infrastructure projects, either proposed or in operation, were identified within a 35km radius of the proposed Hartebeesthoek West WEF, it was determined that only five of these would have any significant impact on the landscape within the visual assessment zone. These projects, WEFs and SEFs, and their associated grid connection infrastructure will alter the inherent sense of place and introduce an increasingly industrial character into a largely natural, pastoral landscape, 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 stipulated for each of these developments by the visual specialists. In light of this and the relatively low level of human habitation in the study area, however, cumulative impacts have been rated as medium.

9.1 Visual Impact Statement

It is SiVEST's opinion that the visual impacts associated with the proposed Hartebeesthoek West WEF are of moderate significance. Proposed changes to the authorised WEF development do not give rise to additional visual impacts or exacerbate the impacts previously identified in respect of the Phezukomoya WEF. Given the low level of human habitation and the relative absence of sensitive receptors, the project is deemed acceptable from a visual perspective, and the Environmental Authorisation (EA) should be amended application. SiVEST is of the opinion that the impacts associated with the construction, operation and decommissioning phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

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Appendix A

IMPACT RATING METHODOLOGY

AN INNOVATIVE APPROACH TO STRUCTURING ENVIRONMENTAL IMPACT ASSESSMENT REPORTS

Part 2: Ranking the Significance of Environmental Aspects and Impacts

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Abstract

This paper (Part 2) describes a qualitative/ semi-quantitative approach to assessing the significance of environmental aspects and environmental impacts. The approach is intended as a tool for use together with the general framework presented in Part 1.

INTRODUCTION

Owing to the complexity of many of the systems that need to be considered when undertaking an Environmental Impact Assessment (EIA), it is not always possible to obtain quantitative data on which to base the impact assessment. Therefore, it is often necessary to use qualitative or semi-quantitative methods to determine the significance of environmental impacts.

The significance ranking approach presented in this paper is intended as a tool for use together with the general framework presented in Part 1 and is the final step in completing the structured and systematic approach. In Part 1 it was shown how environmental impacts can be linked to the project activities via the responsible "mechanisms", which are defined as *environmental aspects* in the ISO 14 000 series of standards. It was explained that significant impacts would only be present if significant aspects are present. Hence, a method for ranking the significance of aspects is required. Once the significance aspects have been identified, it is necessary to rank the significance of the impacts that could result form them.

SIGNIFICANCE OF ENVIRONMENTAL ASPECTS

The significance of environmental aspects can be determined and ranked by considering the criteria presented in Table 1. In some cases it may be necessary to undertake the impact assessment to determine whether a particular aspect is significant. Therefore, a fair degree of iteration is unavoidable during the assessment process.

Table 1 – Criteria used to determine the significance of environmental aspects

Significance Ranking	Negative Aspects	Positive Aspects
H (High)	Will always/often exceed legislation or standards. Has characteristics that could cause significant negative impacts.	Compliance with all legislation and standards. Has characteristics that could cause significant positive impacts.
M (Moderate)	Has characteristics that could cause negative impacts.	Has characteristics that could cause positive impacts.
L (Low)	Will never exceed legislation or standards. Unlikely to cause significant negative impacts.	Will always comply with all legislation and standards. Unlikely to cause significant positive impacts.

The aspect identification and ranking process is largely a screening exercise whereby the aspects that do not have the potential to cause significant impacts are eliminated. Aspects ranked "high" and "moderate" are significant and the possible impacts associated with their presence will need to be determined. Aspects ranked "low" do not warrant further attention.

The significance of the aspects should be ranked on the assumption that the management recommended in the EIA will be in place i.e. *with management*. This represents the scenario that the proponent wishes to have considered for approval. The environmental aspects associated with the proposed project activities during the construction, operational, closure phases (where appropriate) need to be identified. The influence of various project alternatives on the significance of the aspects must also be considered.

It may be desirable to also undertake a *without management* aspect ranking, since this highlights the sensitivity of the key risk areas to management and, hence, the management priorities. However, the dilemma in such an exercise is deciding on how much management to include. In the case of a mining project, for example, does one assume that the tailings dam will be completely absent or merely operated poorly? A useful rule of thumb is to assume that all the management required for operational reasons will be in place, but that any management specifically for environmental control will be absent. The danger in presenting *without management* ranking scenario in an EIA report is that it does not represent the scenario that the proponent wishes to have approved.

SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

Where significant environmental aspects are present ("high" or "moderate"), significant environmental impacts ***may*** result. The significance of the impacts associated with the significant aspects can be determined by considering the risk:

Significance of Environmental Impact (Risk) = Probability x Consequence

The consequence of impacts can be described by considering the severity, spatial extent and duration of the impact.

Severity of Impacts

Table 2 presents the ranking criteria that can used to determine the severity of impacts on the bio-physical and socio-economic environment. Table 3 provides additional ranking criteria for determining the severity of negative impacts on the bio-physical environment.

Table 2 – Criteria for ranking the *Severity* of environmental impacts

Type of Criteria	Negative			Positive		
	H-	M-	L-	L+	M+	H+
Qualitative	Substantial deterioration. Death, illness or injury.	Moderate deterioration. Discomfort.	Minor deterioration. Nuisance or minor irritation.	Minor improvement.	Moderate improvement.	Substantial improvement.
Quantitative	Measurable deterioration.		Change not measurable i.e. will remain within current range.		Measurable improvement.	
	Recommended level will often be violated.	Recommended level will occasionally be violated.	Recommended level will never be violated.		Will be within or better than recommended level.	
Community Response	Vigorous community action.	Widespread complaints.	Sporadic complaints.		No observed reaction.	Favourable publicity

Table 3 – Criteria for ranking the *Severity* of negative impacts on the bio-physical environment

Environment	Ranking Criteria		
	Low (L-)	Medium (M-)	High (H-)
Soils and land capability	Minor deterioration in land capability. Soil alteration resulting in a low negative impact on one of the other environments (e.g. ecology).	Partial loss of land capability. Soil alteration resulting in a moderate negative impact on one of the other environments (e.g. ecology).	Complete loss of land capability. Soil alteration resulting in a high negative impact on one of the other environments (e.g. ecology).
Ecology (Plant and animal life)	Disturbance of areas that are degraded, have little conservation value or are unimportant to humans as a resource. Minor change in species variety or prevalence.	Disturbance of areas that have some conservation value or are of some potential use to humans. Complete change in species variety or prevalence.	Disturbance of areas that are pristine, have conservation value or are an important resource to humans. Destruction of rare or endangered species.
Surface and Groundwater	Quality deterioration resulting in a low negative impact on one of the other environments (ecology, community health etc.)	Quality deterioration resulting in a moderate negative impact on one of the other environments (ecology, community health etc.).	Quality deterioration resulting in a high negative impact on one of the other environments (ecology, community health etc.).

Spatial Extent and Duration of Impacts

The duration and spatial scale of impacts can be ranked using the following criteria:

Table 4 – Ranking the *Duration* and *Spatial Scale* of impacts

	Ranking Criteria		
	L	**M**	**H**
Duration	Quickly reversible Less than the project life Short-term	Reversible over time Life of the project Medium-term	Permanent Beyond closure Long-term
Spatial Scale	Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/national

Where the severity of an impact varies with distance, the severity should be determined at the point of compliance or the point at which sensitive receptors will be encountered. This position corresponds to the spatial extent of the impact.

Consequence of Impacts

Having ranked the severity, duration and spatial extent, the overall consequence of impacts can be determined using the following qualitative guidelines:

Table 5 – Ranking the *Consequence* of an impact

			SEVERITY = L		
DURATION	Long-term	**H**			
	Medium-term	**M**			**MEDIUM**
	Short-term	**L**	**LOW**		
			SEVERITY = M		
DURATION	Long-term	**H**			**HIGH**
	Medium-term	**M**		**MEDIUM**	
	Short-term	**L**	**LOW**		
			SEVERITY = H		
DURATION	Long-term	**H**			
	Medium-term	**M**			**HIGH**
	Short-term	**L**	**MEDIUM**		
			L	**M**	**H**
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/national
			SPATIAL SCALE		

To use Table 5, firstly go to one of the three "layers" based on the severity ranking obtained from Table 2 and/ or Table 3. Thereafter determine the consequence ranking by locating the intersection of the appropriate duration and spatial scale rankings.

Overall Significance of Impacts

Combining the consequence of the impact and the probability of occurrence, as shown by Table 6, provides the overall significance (risk) of impacts.

Table 6 – Ranking the *Overall Significance* of impacts

PROBABILITY	Definite Continuous	**H**	**MEDIUM**		**HIGH**
	Possible Frequent	**M**		**MEDIUM**	
	Unlikely Seldom	**L**	**LOW**		**MEDIUM**
			L	**M**	**H**
			CONSEQUENCE (from Table 5)		

The overall significance ranking of the negative environmental impacts provides the following guidelines for decision making:

Table 7 – Guidelines for decision-making

Overall Significance Ranking	Nature of Impact	Decision Guideline
High	Unacceptable impacts.	Likely to be a fatal flaw.
Moderate	Noticeable impact.	These are unavoidable consequence, which will need to be accepted if the project is allowed to proceed.
Low	Minor impacts.	These impacts are not likely to affect the project decision.

Priority of Primary Impacts

In some cases environmental aspects could result in impacts on a number of environments. For example, the release of contaminated runoff could pollute surface water, which in turn could adversely impact on the ecology. In such cases the impact on the environment in which the first or primary impact occurs should be considered first. In the example "surface water" is the environment on which the primary impact occurs. If it can be shown that the impact on the primary environment will be insignificant, then secondary impacts need not be considered.

CONCLUSIONS

While the significance ranking methodology presented in above is not a substitute for more sophisticated qualitative methods, it is a step forward from the arbitrary methods that are often used to determine the significance of environmental impacts. In many instances it is impractical or prohibitively costly to source the data required to undertake a fully quantitative assessment and, hence, a qualitative or semi-quantities approach is the best option available. If used in conjunction with the general framework outlined in Part 1, it provides a systematic and structured approach to undertaking an EIA.

Appendix B

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

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).

Appendix C

MAPS

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