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05 April 2017
489025/ALLK/1704006

Ms. A. Gibb
SiVEST
PO Box 2921
Rivonia
2128

Attention: Ms. A. Gibb

Dear Ms. Gibb

Peer Review of the Tslsitseng 1 and 2 PV and Grid Connection Visual Impact Assessment Reports

SiVEST Reports: 13303

SiVEST (Pty) Ltd. (SiVEST) is undertaking Environmental Impact Assessments (EIA's) for:

1) The construction of the Tslisitseng Solar 1 Photovoltaic (PV) Energy Facility (**EIA Ref: 14/12/16/3/3/2/889**); and
2) The construction of the Tslisitseng Solar 2 Photovoltaic (PV) Energy Facility (**EIA Ref: 14/12/16/3/3/2/890**)

As well as Basic Assessments for:

1) The construction of the Tlisitseng 1 Substation and associated 132 kV Power Line; and
2) The construction of the Tlisitseng 2 Substation and associated 132 kV Power Line.

As part of the Environmental Authorisation process, a Visual Impact Assessment (VIA) for each of these projects was needed. As SiVEST is the primary environmental assessment practitioner (EAP) for the environmental assessments and VIA, an external peer review is required.

This letter constitutes the independent peer review conducted by Mr K Allan Pr Sci Nat of SRK Consulting (South Africa) (Pty) Ltd. (SRK). As the Tlisitseng 1 and Tlisitseng 2 projects share the same property, and hence the same sensitive receptors, this letter presents the review findings of all four reports.

1. Summary of Peer Review

It must be noted that this review was focussed primarily on the content of the SiVEST VIA Report, and did not focus on formatting or grammatical errors. Some recommendations for grammatical review have however been made in the final report reviews. No **site visit** was undertaken as part of the peer review.

SRK's review has been guided by the NEMA 2014 EIA Regulations, Government Notice (GN) R982 of 04 December 2014, whereby all specialist studies undertaken as part of an EIA, are required to comply with Appendix 6 of the notice. This is presented in Table 1, below. A **detailed CV** of the peer reviewer (Mr K Allan Pr Sci Nat) is attached to this letter.

Mr Allan is of the opinion that the VIA Report, compiled by SiVEST is fair and that the **terms of reference** and **methodology** used were **transparent and well stated**. There is a substantial focus on potential sensitive viewers, with care taken to attempt to identify sensitive viewers that could potentially be affected by the projects.

Table 1 summarises the legal requirements for all specialist studies, as well as an indication of the relevant Section of this report which complies with the requirement. For ease of reference, the reports for the PV Facilities are labelled: **PV** and the substation and 132 kV power lines are labelled: **Grid**

Table 1: Legal Requirements for Specialist Studies

Legal Requirement		**Relevant Section in Specialist study**
(1)	A specialist report prepared in terms of these Regulations must contain details of:	
(a)	The specialist who prepared the report; and	**Present**
	The expertise of that specialist to compile a specialist report including curriculum vitae.	**Missing**
(b)	A declaration that the specialist is independent in a form as may be specified by the competent authority.	**Present**
(c)	An indication of the scope of, and the purpose for which, the report was prepared.	**Section 1 of Report**
(d)	The date and season of the site investigation and the relevance of the season to the outcome of the assessment.	**Present (Grid Section 1.3) (PV Section 1.4)**
(e)	A description of the methodology adopted in preparing the report or carrying out the specialised process.	**Present (Grid Section 1.4) (PV Section 1.5)**
(f)	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure.	**Present (Section 2)**
(g)	An identification of any areas to be avoided, including buffers.	**Present Section 4 and Section 5**
(h)	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers.	**Present (various sections)**
(i)	A description of any assumptions made and any uncertainties or gaps in knowledge.	**Present (Section 1.4)**
(j)	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment.	**Present (Section 4 and Section 5)**
(k)	Any mitigation measures for inclusion in the EMPR. *Note that an EMPR has three levels of impact management:* *Impact management action;* *Impact management outcome; and* *Impact management objective.*	**Present (Section 4)**
(l)	Any conditions/aspects for inclusion in the environmental authorisation.	**Present (Section 4)**
(m)	Any monitoring requirements for inclusion in the EMPR or environmental authorisation.	**Present (Section 4)**

Legal Requirement		Relevant Section in Specialist study
(n)	A reasoned opinion[1] (Environmental Impact Statement)-	**Present (Section 6.1)**
	As to whether the proposed activity or portions thereof should be authorised.	**Present (Section 6)**
	If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPR, and where applicable, the closure plan.	**Present (Section 6)**
(o)	A description of any consultation process that was undertaken during the course of preparing the specialist report.	**N/A**
(p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto.	**N/A**
(q)	Any other information requested by the competent authority.	**N/A**

While the **mitigation measures** proposed in the reports were clear and appropriate, some **additional recommendations** for improving the report were identified during the review process. These are listed below:

1. Recommendation was made that vegetation rehabilitation could involve the establishment of nurseries, to aid in reducing the time for the vegetation cleared to re-establish.
2. Some text in the report may not be relevant or too emotive; these recommendations are made in the report.
3. Recommendations for additional mitigation measures have been included in the text.

Additional comments for the reports have been compiled in separate Word Document submitted to SiVEST on 29 July 2016:

- **SRK Report: 489025_SivestReview_Tlisitseng_1_GridReview_20160729**
- **SRK Report: 489025_SivestReview_Tlisitseng_1_PV_20160729**
- **SRK Report: 489025_SivestReview_Tlisitseng_2_GridReview_20160729**
- **SRK Report: 489025_SivestReview_Tlisitseng_2_PV_20160729**

SRK is of the opinion that the reports were **well written and easy** to understand. Should you have any queries regarding the review or comments made in the reviewed document, please do not hesitate to contact Mr. Keagan Allan, SRK (031 279 1200).

Yours faithfully,

SRK Consulting (South Africa) (Pty) Ltd

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Mr. K. Allan (Pr. Sci. Nat.)
Senior GIS Specialist

Mr. M.J. Morris (Pr. Eng.)
Partner

Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd (SRK). SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

[1] Also include a summary of the impacts.

BIOTHERM ENERGY PTY (LTD)

Proposed Construction of the Tlisitseng 1 Substation and associated 132kV Power Line near Lichtenburg, North West Province

Visual Impact Assessment Report - Basic Assessment

Issue Date: 09 May 2017
Revision No.: 4
Project No.: 13303

Date:	09 May 2017
Document Title:	Proposed Construction of the Tlisitseng 1 Substation and Associated 132kV Power Line near Lichtenburg, North West Province: Visual Impact Assessment Report – Basic Assessment
Author:	**Stephan Jacobs** B.Sc. (Hons) Environmental Management & Analysis (UP) BSc Environmental Sciences (UP)
Revision Number:	#4
Checked by:	**Andrea Gibb** (internal review) B.Sc. (Hons) Environmental Management (UNISA) BSc Landscape Architecture *Cum Laude* (UP) **Keagan Allan** – SRK Consulting (South Africa) (Pty) Ltd (peer review) Pr. Sci Nat
Approved:	Kelly Tucker
Signature:	
For:	SiVEST Environmental Division

For full details and the expertise of the specialists that compiled / checked this report refer to Appendix C.

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	
NEAS Reference Number:	
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

Proposed Construction of the Tlisitseng 1 Substation and Associated 132kV Power Line near Lichtenburg, North West Province

Specialist:	**SiVEST SA (Pty) Ltd**		
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Project Consultant:	**SiVEST SA (Pty) Ltd**		
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The specialist appointed in terms of the Regulations

I, **Stephan Jacobs**, declare that --

General declaration:

- 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 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist

SiVEST SA (Pty) Ltd

Name of company (if applicable)

09 March 2016

Date

The specialist appointed in terms of the Regulations

I, **Andrea Gibb**, declare that --

General declaration:

- 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 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist

SiVEST SA (Pty) Ltd

Name of company (if applicable)

19 April 2016

Date

BIOTHERM ENERGY PTY (LTD)

PROPOSED CONSTRUCTION OF THE TLISITSENG 1 SUBSTATION AND ASSOCIATED 132kV POWER LINE NEAR LICHTENBURG, NORTH WEST PROVINCE

VISUAL IMPACT ASSESSMENT REPORT - BASIC ASSESSMENT

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GLOSSARY OF TERMS

ABBREVIATIONS

BA Basic Assessment
DM District Municipality
EIA Environmental Impact Assessment
I&AP Interested and/or Affected Party
kV Kilovolt
LM Local Municipality
MTS Main Transmission Substation
OHLOverhead Line
NGI National geo-spatial information
SANBI South African National Biodiversity Institute
VIA Visual Impact Assessment

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).

Power line route: The alignment followed by the proposed power line or power line alternatives.

Power line corridor: The 500m wide power line route assessed during the BA in order to allow for flexibility when determining the final route alignment. Ultimately the 31m wide power line servitude would be routed within the 500m wide corridor.

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: The study area is assumed to encompass a zone of 5km from the outer boundary of the power line corridor. This is also referred to as the visual assessment zone.

Viewshed: The geographical area, based entirely on topography, from where an object / structure would be visible, i.e. the zone of visual influence. The viewshed defines the outer boundary of 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), 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.

BIOTHERM ENERGY PTY (LTD)

PROPOSED CONSTRUCTION OF THE TLISITSENG 1 SUBSTATION AND ASSOCIATED 132kV POWER LINE NEAR LICHTENBURG, NORTH WEST PROVINCE

VISUAL IMPACT ASSESSMENT REPORT - BASIC ASSESSMENT

1 INTRODUCTION

BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) are proposing to construct a 132kV on-site substation, namely Tlisitseng 1 Substation, and associated 132kV power line near Lichtenburg in the North West Province (hereafter referred to as the 'proposed development'). The proposed development is aimed at connecting BioTherm's proposed Tlisitseng Solar 1 photovoltaic (PV) energy facility (part of separate on-going EIA process) onto Eskom's national grid at the existing Watershed Main Transmission substation (MTS). SiVEST South Africa (Pty) Ltd (hereafter referred to as SiVEST) have been appointed by BioTherm to undertake the Basic Assessment (BA) for proposed construction of the 132kV on-site Tlisitseng 1 Substation, 132V power line and associated infrastructure. As part of the BA studies conducted for the proposed development, the need to undertake a visual impact assessment (VIA) has been identified. During the BA, a desktop assessment of the visual environment within the study area was undertaken in order to characterise the area and broadly identify all the potential visual impacts and issues relating to the proposed development. This visual assessment undertaken during the BA focuses on the potential sensitive receptor locations, and provides an assessment of the magnitude and significance of the visual impacts associated with the proposed 132kV on-site Tlisitseng 1 Substation and associated 132kV power line. The main deliverable of this study is the generation of maps indicating visual receptors within the various distance bands and this report indicating the findings of the study.

1.1 Project Description

At this stage, it is understood that the proposed development will include the construction / development of a 132kV on-site substation (namely Tlisitseng 1 Substation), as well as a 132kV power line, which will aim at connecting the proposed Tlisitseng solar 1 PV energy facility (part of

separate on-going EIA process) to Eskom's national grid. The proposed development will include the following components/factors:

- Construction of an on-site substation with a capacity of up to 132kV (referred to as Tlisitseng 1 substation) occupying a footprint area of approximately 2.25ha;
- Construction of a power line with a capacity of up to 132kV routed between the new proposed on-site Tlisitseng 1 substation and the existing Watershed MTS;
- The proposed 132kV power line will have a servitude width of approximately 31m;
- An on-site switching substation with grid transformer(s) for voltage step up to a high voltage of up to 132kV. The switching station will be a common substation connecting multiple phases of the project to the Watershed MTS;
- Access roads; and
- Administration, control and warehouse buildings.

The 132kV power line will consist of a series of towers located approximately 250 to 400m apart, depending on the terrain. It is proposed that the steel lattice tower type (518H and 518C), would predominantly be used for the proposed power line in combination with other towers, as required (e.g. guyed 'vee' suspension towers). The steel lattice tower type is approximately 28m in height. The height will vary based on the terrain, but will ensure minimum Overhead Line (OHL) clearances with buildings and surrounding infrastructure.The exact location of the towers will be determined during the final design stages of the power line.

Drawings of the tower type are indicated in **Figure 1** below.

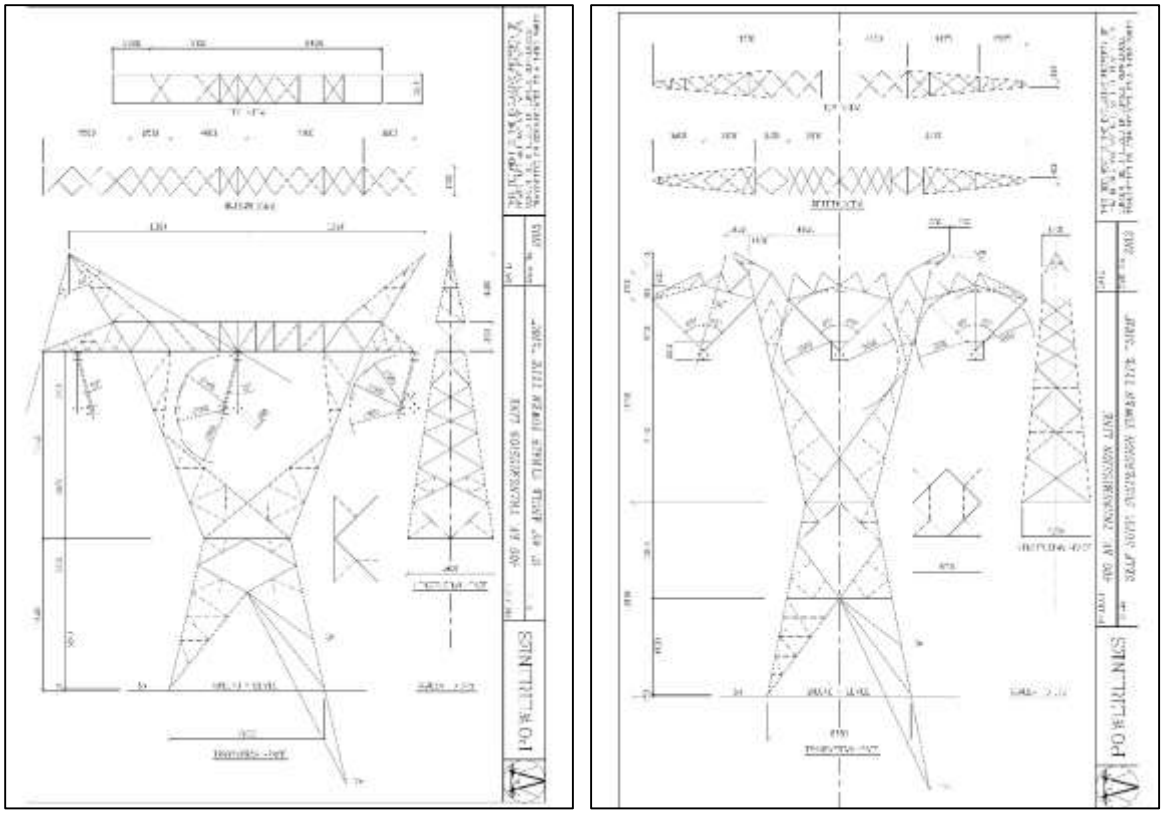

Figure 1: Proposed Steel Lattice Tower Types

1.2 Site Location

The proposed development site for the 132kV on-site Tlisitseng 1 Substation and 132kV power line will be located within the North West Province, approximately 6km north-west of Lichtenburg. It falls within the Ditsobotla Local Municipality that forms part of the Ngaka Modiri Molema District Municipality (**Figure 2**).

The application site for the proposed 132kV on-site Tlisitseng 1 Substation is located on Portion 25 of the Farm Houthaalboomen No 31, which is approximately 1000ha in extent.

As previously mentioned, grid connection for the proposed Tlisitseng solar 1 PV energy facility (part of separate on-going EIA process) will be to the existing Watershed MTS via a proposed 132kV power line. The Watershed MTS is located immediately adjacent to the south-east boundary of the PV facility application site. It should also be noted that the proposed 132kV power line will be either 1.9 or 2.9km in extent, depending on which substation alternative is chosen as the preferred option. The PV facility application site, proposed 132kV on-site Tlisitseng 1 Substation site and 132kV power line corridor route are shown in the locality map below (**Figure 3**).

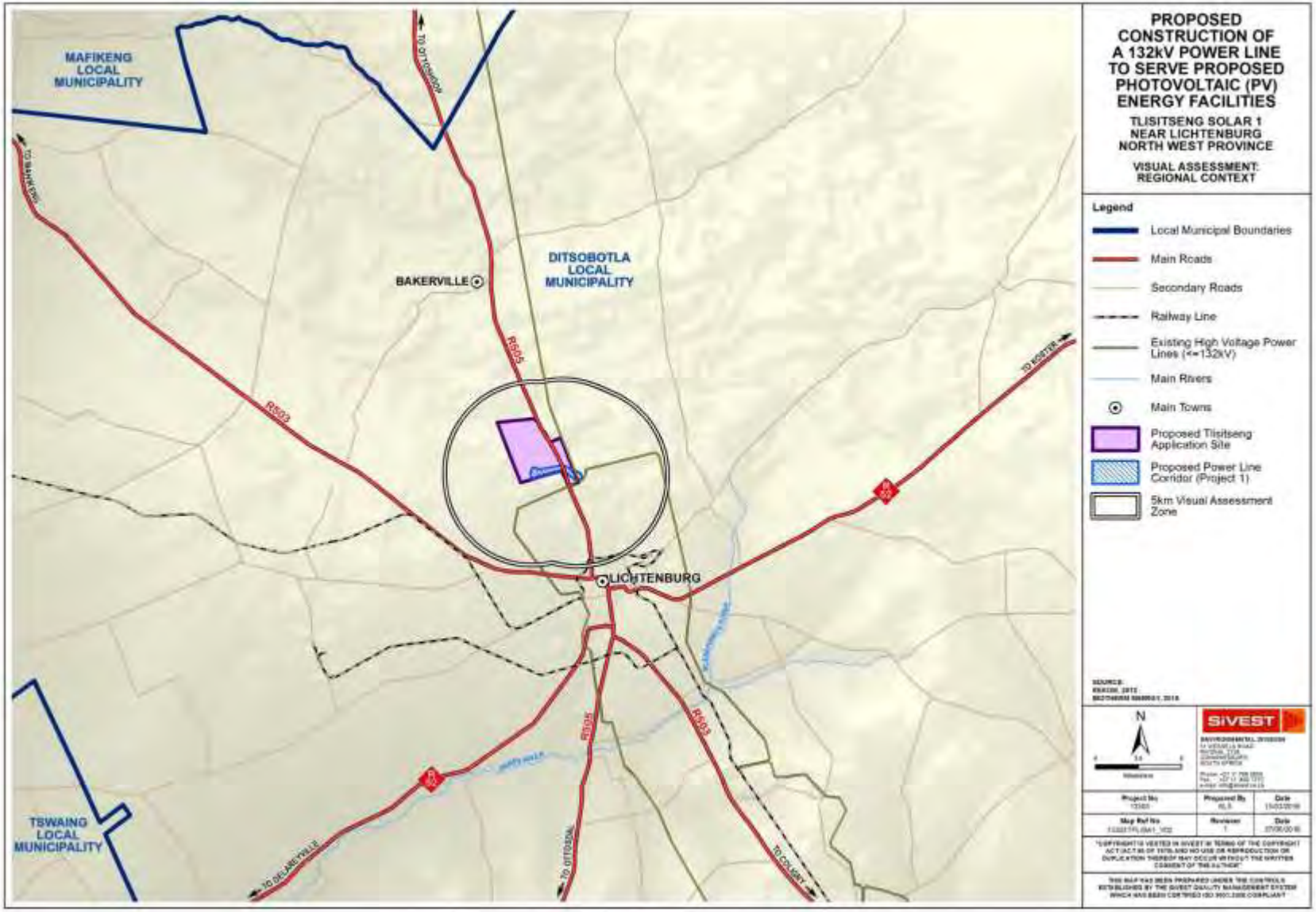

Figure 2: Regional Context Map

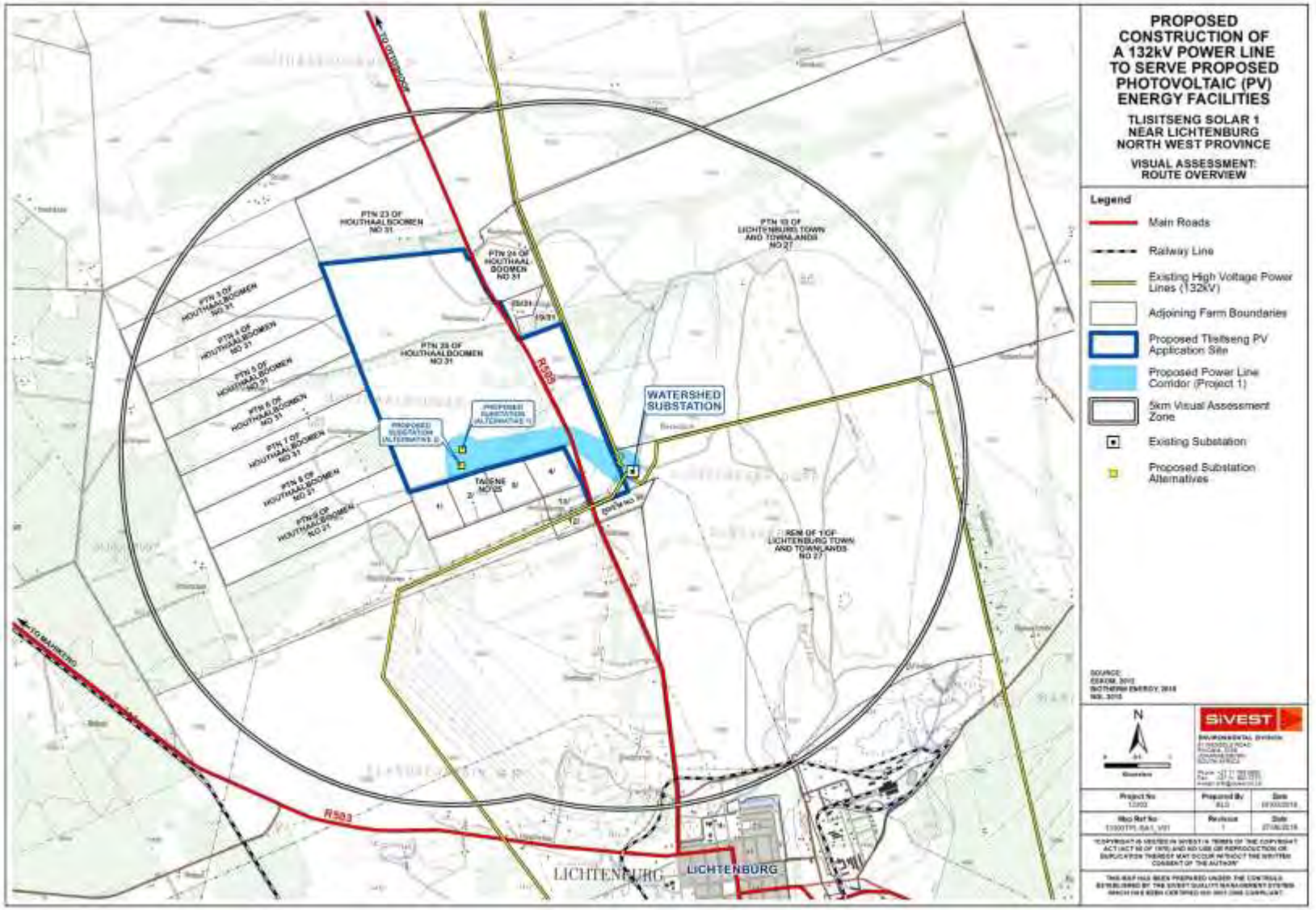

Figure 3: Locality Map

1.3 Assumptions and Limitations

- Given the nature of the receiving environment and the height of the proposed substation, power lines and associated infrastructure, the study area or visual assessment zone is assumed to encompass a zone of 5km from the proposed development – i.e. all areas within a 5km radius of the power line corridor. The 5km radius was assigned as distance is a critical factor when assessing visual impacts and although the proposed development may still be visible from areas outside the 5km radius, the degree of visual impact would diminish considerably. Thus the need to assess the impact on potential receptors outside the visual assessment zone would not be warranted.

- Due to the extensive number of farmsteads and residential dwellings located within 5km of the power line corridor, which could potentially be sensitive to the proposed development, the identification and impact assessment rating on potentially sensitive visual receptor locations was based on a combination of desktop assessment as well as field-based observation. Initially Google Earth imagery was used to identify potentially sensitive receptor locations within the study area. Thereafter a site visit was undertaken to assist with rating the impact of the proposed development from each potentially sensitive visual receptor location and to eliminate receptors that are unlikely to be influenced by the proposed development. This involves establishing the visual character and level of transformation within the study area, classifying the study area into zones of visual contrast and identifying screening factors within the study area.

- It should be noted that the 'experiencing' of visual impacts is subjective and largely based on the perception of the viewer or receptor. A number of broad assumptions were made in terms of the sensitivity of the receptors to the proposed development. This is usually dependent on the use of the facility and the economic dependency on the natural / untransformed quality of views from the facility. 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 and residential dwellings within natural / rural settings. Therefore, not all receptor locations would necessarily perceive the proposed development in a negative way.

- No viewsheds were generated during this visual study, as the topography within the study area is relatively flat and no detailed contours were available. Within this context, minor topographical features, vegetative screening, or man-made structures would be important factors which would influence the degree of visibility and which would not be factored in by the viewsheds.

- A matrix has been developed to assist in the assessment of the potential visual impact at each receptor location. The limitations of quantitatively assessing a largely subjective or qualitative type of impact should be noted. The matrix is relatively simplistic in considering three main parameters relating to visual impact, but provides a reasonably accurate indicative assessment of the degree of visual impact likely to be exerted on each receptor location by the proposed substation and power line. The matrix should therefore be seen as a representation of the likely visual impact at a receptor location.

- The assessment of receptor-based impacts has been based on the power line corridor and substation site alternatives provided by the proponent. It is recognised however that the exact route of the power line within the corridor has not been determined, and depending on this the proposed power line may result in greater or lesser visual impacts on receptor locations.

- Visualisation modelling has not been undertaken for the proposed development due to budget limitations. Should the need for visualisation modelling be proven by stakeholder / I&AP feedback, then this will be able to be incorporated into this assessment.

- The feedback regarding the visual environment received from the public participation process and as part of the social impact assessment to date has been incorporated into this report. Any additional feedback relevant to the visual environment received will be incorporated into further drafts of this report.

- Operational and security lighting will be required for the proposed on-site substation and associated infrastructure proposed within the development footprint. At the time of undertaking the visual study no information was available regarding the type and intensity of lighting required and therefore the potential impact of lighting at night has not been assessed at a detailed level. General measures to mitigate the impact of additional light sources on the ambiance of the nightscape have been provided.

- Most rainfall within the area occurs from November to April during the summer months. Therefore as the fieldwork was undertaken in December during the summer season the surrounding vegetation can be expected to provide the maximum potential screening. During winter months the visual impact of the proposed development may therefore be greater, particularly from farmhouses surrounded by tall deciduous trees.

1.4 Assessment Methodology

1.4.1 Field work and photographic review

From the 1st to the 2nd of December 2015 (summer), the study area was visited in order to;

- identify the landscape characteristics;
- classify the study area into zones of visual contrast;
- capture photos of the proposed study area;
- verify the potentially sensitive visual receptor locations previously identified via desktop means;
- eliminate receptors that are unlikely to be influenced by the proposed development; and
- identify any additional visually sensitive receptor locations within the study area.

1.4.2 Physical landscape characteristics

A site visit and digital information from spatial databases such as the National Geo-spatial Information (NGI), the South African National Biodiversity Institute (SANBI) and the South African National Land Cover (Geoterraimage – 2014) were sourced to provide baseline information on the topography, vegetation and land use in the study area. These physical landscape characteristics are important factors which influence the visual character and visual sensitivity of the study area.

1.4.3 Identification of sensitive receptors

During the field investigation, potentially sensitive visual receptor locations within the study area, such as residences, were identified and assessed as they may be potentially sensitive to the visual impacts associated with the proposed development. It must be noted that Google Earth imagery was used to assist with identifying and assessing these potentially sensitive receptor locations.

1.4.4 Impact Assessment

A rating matrix 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 potential visual impact of the proposed development. The rating matrix made use of a number of different factors including geographical extent, probability, reversibility, irreplaceable loss of resources, duration, cumulative effect and intensity, 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 the sensitive receptor locations, as identified. This matrix is based on the distance of a receptor from the proposed development, the presence of screening factors and the degree to which the proposed development would contrast with the surrounding environment from a particular location.

Thereafter, the substation site alternatives were comparatively assessed, in order to ascertain the preferred alternative from a visual perspective.

1.4.5 Consultation with I&APs

Continuous consultation with Interested and Affected Parties (I&APs) undertaken during the public participation process (PPP) will be used to help establish how the proposed development will be perceived by the various receptor locations and the degree to which the impact will be regarded as negative. Although I&APs have not as yet provided any feedback in this regard, the report will be updated to include relevant information as and when it becomes available.

2 VISUAL BASELINE ASSESSMENT

The physical and land use related characteristics are outlined below as they are important factors contributing to the visibility of a development and visual character of the study area. Defining the visual character 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 according to this visual baseline by establishing the degree to which the development would contrast or conform with 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, economic importance of the scenic quality of the area, inherent cultural value of the area and presence of visual receptors.

2.1 Topography

The topography within and in the immediate vicinity of the proposed 132kV on-site Tlisitseng 1 Substation and 132kV power line development sites is characterised by a flat to gently undulating landscape sloping very gradually down in a south-easterly direction.

A representation of the typical views from the proposed 132kV on-site Tlisitseng 1 Substation site has been provided in **Figure 4** below.

Figure 4: View from the proposed Tlisitseng 1 Substation application site showing the typically flat to gently undulating terrain within the study area

The topography in the wider study area is largely characterised by level plains with little noticeable relief and very gradual slopes (**Figure 5**). In general, the study area slopes down in a southerly direction towards the town of Lichtenburg.

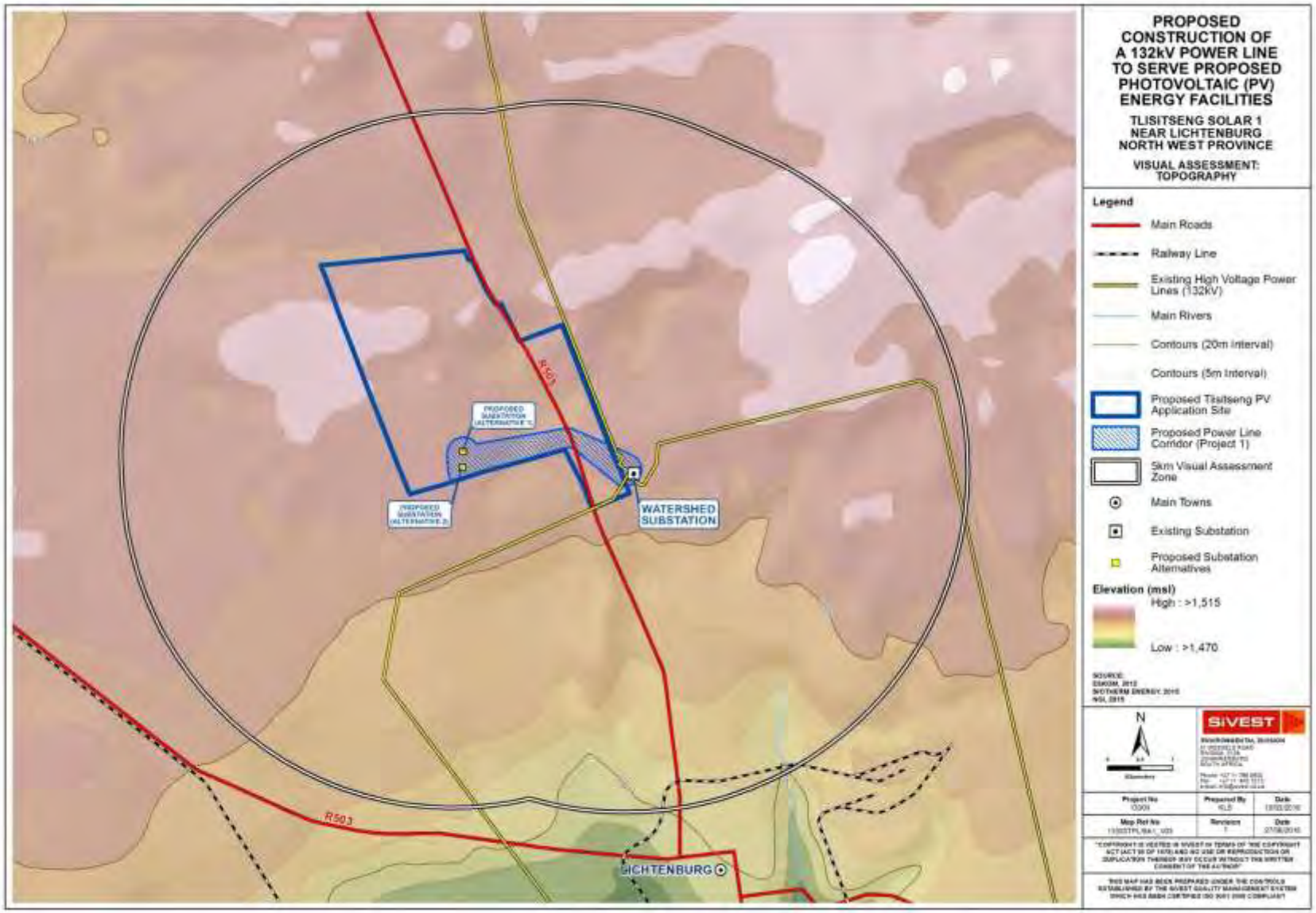

Figure 5: Topography within the study area

2.1.1 Visual Implications

The very flat nature of the topography is a strong factor influencing the types of vistas typically present in the study area, as there are few areas of rising ground to block views and limit viewsheds. As a result, typically wide-ranging vistas are experienced within the study area, especially from locally higher elevations.

2.2 Vegetation and land cover

The study area is covered by the Carlton Dolomite Grassland vegetation type (**Figure 7**), which is characterised by low shrubland with an open tree layer and species-rich grasslands. In certain areas, has anthropogenic activities have had an impact on the natural vegetation. This is evident around farmsteads, where over many years tall exotic trees and other typical garden vegetation have been established. Much of the study area is however still charaterised by natural low shrubland and grassland (**Figure 6**) with limited transformation.

Figure 6: Typical vegetation cover within the study area

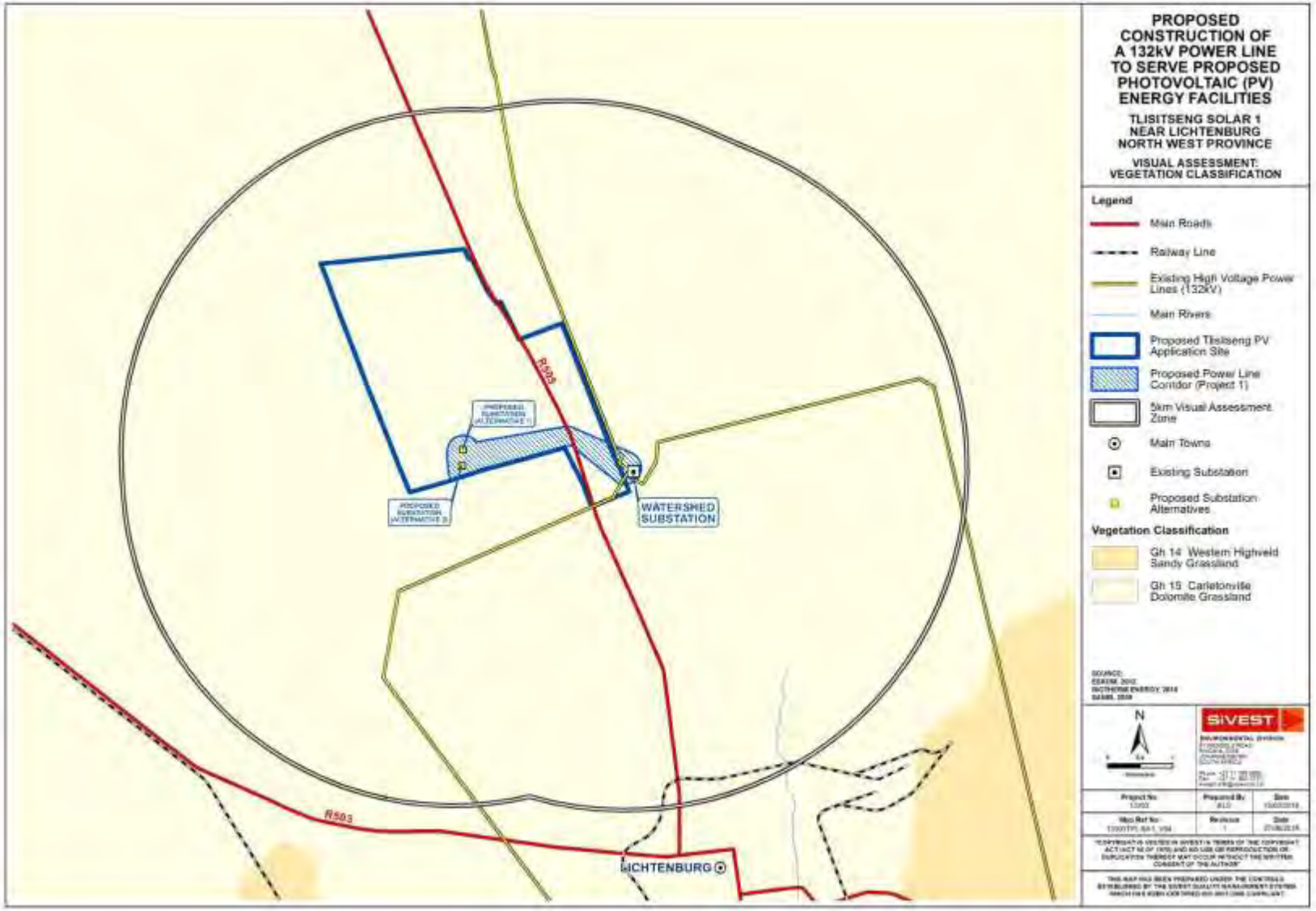

Figure 7: Vegetation within the study area

Much of the assessment area is characterised by natural unimproved vegetation (**Figure 13**). Cultivated land is largely concentrated on the western boundary of the study area, with smaller, scattered patches of cultivation evident throughout the study area (**Figure 8**). Maize is the main crop produced in the area with both dryland and irrigated farming practises in evidence.

Figure 8: Typical view of cultivated land which can be found scattered throughout the study area. Cultivated land is however largely concentrated on the western boundary of the study area.

Built form, in areas where cultivation occurs, is limited to isolated farmsteads, gravel access roads, ancillary farm buildings, telephone lines, windmills, fences and the remnants of old workers' dwellings.

Figure 9: Typical built form present in areas where cultivation occurs

Human influence is also visible in the form of the R505 main road which traverses the study area in a north-west to south-east direction (**Figure 10**) as well as electricity transmission infrastructure comprising of three (3) 132kV power lines feeding into the Watershed MTS. It must be noted that the tall steel structures that make up the Watershed MTS, as well as the tall steel towers of the existing 132kV power lines, are visible from various parts of the study area (**Figure 11**). In addition, there are some relatively small scale mining/quarrying activities in the study area.

Figure 10: R505 main road which traverses the study area in a north-west to south-east direction

Figure 11: Tall steel structures that make up the Watershed MTS, as well as the tall steel towers of the existing 132kV power lines that run to the Watershed MTS, which can be seen from various parts of the study area

The closest built-up area is the agricultural town of Lichtenburg, which is located on the southern boundary of the study area, with only a small portion of the town lying just inside the 5km radius. Urban development on the outskirts of Lichtenburg comprises a mix of commercial, light/service industrial and residential development (**Figure 12**) as well as road and rail infrastructure largely concentrated on the eastern side of the R505 main road.

Figure 12: Outskirts of the town of Lichtenburg which comprises a mix of commercial, light/service industrial and residential development

A large portion of the study area situated to the east of the R505 has been demarcated as the Lichtenburg Game Breeding Centre, a largely untransformed area which was previously operated by the National Zoological Gardens of South Africa. This game breeding centre was mainly aimed at furthering the breeding programmes of endangered species already in place by the National Zoo, as well as supplementing the populations of local and international zoos. It must however be noted that at present, the game breeding centre is no longer operated by the National Zoological Gardens of South Africa and is therefore currently not operational. The Lichtenburg Vakansie Oord is situated directly adjacent to the Lichtenburg Game Breeding Centre and provides an ideal destination for tourists and people on vacation.

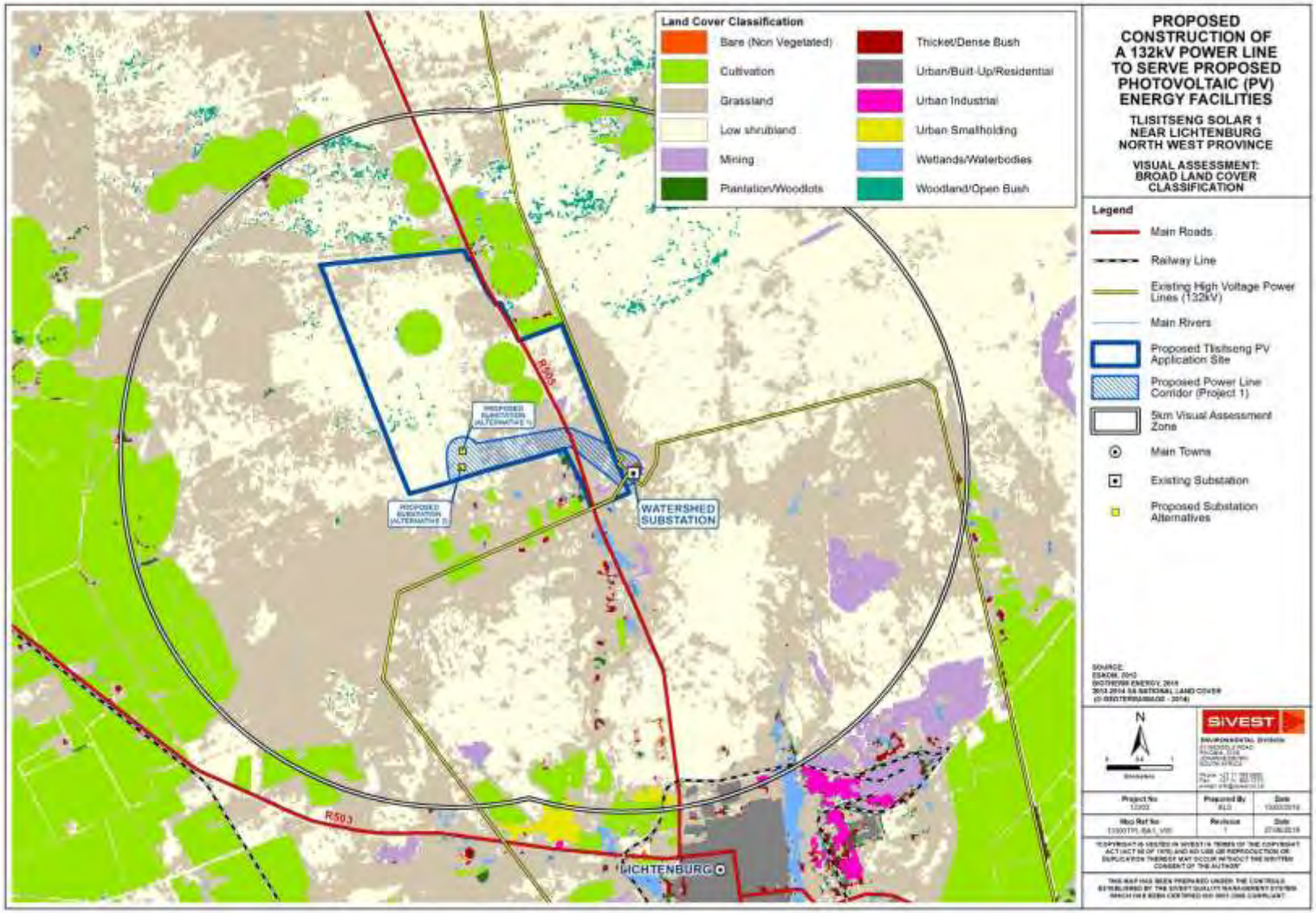

Figure 13: Land cover within the study area

2.2.1 Visual Implications

The predominant very low shrub layer and open areas of cultivated fields / grasslands results in wide-open vistas across most of the study area. Only in areas where tall trees (sometimes exotic) have been established around farmhouses, would the vegetation provide visual screening (**Figure 14**). The relatively low density of human habitation and the presence of natural vegetation cover across large portions of the study area would give the viewer the general impression of a largely natural rural setting (**Figure 15**). There are however significant patches of cultivation in the study area which have transformed the natural characteristics of the area. High levels of human transformation and visual degradation only become evident in the southern sector of the study area where urban/peri-urban development has taken place on the outskirts of Lichtenburg. The presence of the Watershed MTS and other linear elements are also expected to influence the visual character of the surrounding area, reducing the visual implications of the proposed development within these areas.

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

Figure 14: Example of tall trees that have been established around farmhouses and which provide visual screening

Figure 15: Typical natural rural visual character found within larger portions of the study area

2.3 Visual Character

Visual character can be defined based on the level of change or transformation from a completely natural setting, which would represent 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 electrical infrastructure.

As previously mentioned, much of the study area is characterised by rural areas with low densities of human settlement. Agriculture in the form of maize cultivation is the dominant land use, which has transformed the natural vegetation in some areas. However, a large portion of the study area has retained a natural appearance due to the presence of the low shrubs and grasslands. The most prominent anthropogenic elements in these areas include the R505 main road, 132kV power lines, a substation (Watershed MTS) and other linear elements, such as telephone poles, communication poles and farm boundary fences. The presence of this infrastructure is an important factor in this

context, as the introduction of the proposed 132kV on-site Tlisitseng 1 Substation and associated 132kV power line would result in less visual contrast where other anthropogenic elements (such as the Watershed MTS) are already present. Other human infrastructure in this setting occurs at a low density, and includes several gravel access roads and a west-east aligned railway line on the northern perimeter of Lichtenburg. Overall, the study area has a natural visual character, with certain areas displaying a rural or pastoral component where maize cultivation and farmsteads occur.

The relatively low density of human transformation throughout the surrounding area is an important component contributing to the largely natural visual character of the study area. This is important in the context of potential visual impacts associated with the proposed development of a substation and 132kV power line as introducing this type of development could be considered to be a degrading factor in this context.

It should however be noted that other solar energy facilities are proposed in relatively close proximity to the proposed development. These facilities and their associated infrastructure, typically consist of very large structures which are highly visible. As such, these facilities will significantly alter the visual character and baseline in the study area if constructed and make it appear to have a more industrial-type visual character.

2.4 Cultural, Historical and Scenic Value

Cultural landscapes are becoming increasingly important concepts in terms of the preservation and management of rural and urban settings across the world. The concept of 'cultural landscape' is a way of looking at a place that focuses on the relationship between human activity and the biophysical environment (Breedlove, 2002). The cultural landscape concept is relatively new in the heritage conservation movement across the world. In 1992 the World Heritage Committee adopted the following definition for cultural landscapes:

Cultural landscapes represent 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.

According to the Committee's Operational Guidelines Cultural Landscapes can fall into three (3) categories

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 greater area surrounding the proposed development site is an important component when assessing visual character and scenic value. The surrounding area can be considered to be typical of a rural farming landscape that consists of relatively flat areas of natural low shrubland and grassland interspersed with farmsteads, windmills, livestock holding pens and agricultural land Livestock farming and other forms of agriculture, such as maize production, are also evident within the surrounding area. This can be attributed to the fact that the nearby town of Lichtenburg is situated in the heart of the maize triangle, which is the main maize growing area in South Africa. Today the town is the centre of a huge farming district where maize, groundnuts and sunflower seeds are the main crops (http://www.places.co.za/html/lichtenburg.html).

The town of Lichtenburg was established in 1873 and is situated in the very western corner of South Africa's maize triangle. Lichtenburg is a farming and industrial town known for the manufacture of cement. (http://showme.co.za/south-africa/north-west/central-district/lichtenburg/). Apart from the agricultural, mining and quarrying activities taking place in the LM, there exists an opportunity for conservation and tourism. It should also be noted that the area surrounding Lichtenburg has a rich diamond mining history. In 1926 a diamond was found on the farm Elandsputte, resulting in a diamond rush where more than 100 000 diggers streamed to Lichtenburg. In 1927, 25 000 runners took part to peg their claims in one of the biggest diamond rushes in history, which resulted in the biggest pure red diamond ("pigeon blood red") in the world being found there (http://www.sa-venues.com/game-reserves/nwp_lichtenburg.htm). Popular activities in the area include game viewing, fishing and motor car racing. Lichtenburg is also perfectly positioned to be an ideal stopover for travelers from Johannesburg to Mafikeng and Mmabatho. Tourist attractions situated within the greater area include the Lichtenburg Diggings Museum, Bakerville, Wondergat and the Lichtenburg Game Breeding Centre.

There are several attractions in Lichtenburg that pay homage to the town's rich Boer and prospector history as well as its prosperous farming and manufacturing present. Lichtenburg is the resting place of Anglo-Boer War General Koos de la Rey, and a statue of the General on his horse has been erected in the town square. The town and surrounds feature many heritage homes and a couple of National Monuments. The Lichtenburg Diggings Museum has exhibits of the alluvial diamond diggings which lasted from 1925-1935, then the richest public diggings in the world (http://www.southafrica.com/museums/lichtenburg/). The Ampie Bosman Cultural History Museum can also be found within the town of Lichtenburg and gives an introduction to the history of the town. In addition, a number of historical buildings can also be found within the town of Lichtenburg and include:

- The Dutch Reformed Church in Gerrit Maritz Street erected in 1890 (Declared a National Monument);
- The old magistrate's building which dates from 1895/96;

- The home where General De la Rey lived. This was demolished during the Anglo-Boer War but was rebuilt on the original foundations in 1902;
- The home of the founder of Lichtenburg, H.A. Greeff, built in 1875, which is still standing; and
- An old plantation house, home of the pioneer in dry-land farming, Col. H du Toit, erected in 1910.

The nearest known tourist attraction within the study area is the Lichtenburg Game Breeding Centre which is situated 2km north-east of Lichtenburg. The Lichtenburg Game Breeding Centre was operated by the National Zoological Gardens of South Africa and was mainly aimed at furthering the breeding programmes of endangered species already in place by the National Zoo, as well as supplementing the populations of local and international zoos. The reserve has maintained a largely natural character and was used to breed animals such as the addax, scimitar horned and Arabian oryx, and the mohrr gazelle. The centre is also characterised by the presence of a wetland area which used to be home to unique animals such as the pygmy hippo and Pere David's deer. White rhino, blue wildebeest, zebra, impala, gemsbok and many other species could also be found within the breeding centre. In addition, part of this wetland area has been honed into a series of dams and pans that function as a haven for water birds. The centre also features one of the largest bird hides in the country and special night drives can be arranged as the reserve has a network of game drive routes (http://www.sa-venues.com/game-reserves/nwp_lichtenburg.htm).

Approximately 20km north of Lichtenburg lies the world-renowned diamond diggings known as "Bakerville". It was the richest public diggings ever mined and is only one of several "Diggers Towns" developed in Wild West style. Approximately 40km on the Mafikeng road lies "Wondergat", which is one of the deepest sinkholes in South Africa where deep-freshwater diving can be practiced.

Based on the above, the study area can be regarded as a type 'ii' organically evolving cultural landscape. It can be considered both a relict landscape, due to rich history dating back to 1873 and a continuing landscape as the typical rural farming landscape represent how the environment has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction. The presence of small towns, such as Lichtenburg, engulfed by an otherwise rural environment, form an integral part of the wider landscape. In addition, the rich history could attract tourists into the area. This is important in the context of potential visual impacts associated with the proposed development of an on-site substation and power line as introducing this type of development could be considered to be a degrading factor in the context of the natural or rural / pastoral character of the study area, as discussed further below.

2.5 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), 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 BA 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 the erection of an on-site substation or power line 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** - Presence of receptors, 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										

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

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

Based on the above factors, the study area is rated as having a low visual sensitivity. This is mainly owing to the relatively uninhabited character of the area and the presence of road, rail and electricity transmission infrastructure which would likely reduce the scenic quality of the area. 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. As described below, a number of potentially sensitive receptors are present in the study area.

It should be noted that several solar energy facilities are proposed within relatively close proximity to the proposed project.

2.6 Sensitive Visual Receptor Locations

A sensitive receptor location is defined as a location, from where receptors would potentially be adversely impacted by a proposed development. This takes into account a subjective factor on behalf of the viewer – i.e. whether the viewer would consider the impact as a negative impact. As described above, the adverse impact is often associated with the alteration of the visual character of the area in terms of the intrusion of the proposed on-site substation and 132kV power line into a 'view', which may affect the 'sense of place'. 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 (esp. nature-based) tourism or sites with historical and cultural value 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 settings where the development may influence the typical character of their views; and

- feedback from interested and affected parties, as raised during the public participation process conducted as part of the BA study.

A distinction must be made between a receptor location and a sensitive receptor location. Receptor locations are sites from where the proposed on-site substation and 132kV power line may be visible, but the receptor may not necessarily be adversely affected by any visual intrusion associated with the development. Receptor locations include locations of commercial activities and certain movement corridors, such as roads that are not tourism routes. 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.

Generally, the visibility of the development would diminish exponentially over distance. In order to account for this distance bands were used to assign zones of visual impact from the proposed development site. As such, the proposed development would be more visible to receptors located within a short distance and these would experience a higher adverse visual impact than those located at a moderate or long distance from the proposed development. The distance of a sensitive receptor location from the proposed development site was taken into account when rating the visual impact of the proposed development on these potential receptors.

Based on the height and scale of the project, as well as the investigations undertaken during the fieldwork, the radii chosen to assign these zones of visual impact are as follows:

- 0 < 500m (high impact zone);
- 500m < 2km (moderate impact zone); and
- 2km < 5km (low impact zone)

A number of potentially sensitive visual receptors were identified. These are indicated in **Figure 23** below and each receptor is identified by a specific number (e.g. VR 1 = Visual Receptor 1). Of the potentially sensitive visual receptors identified, only three (3) receptor locations were identified as being sensitive within the study area due to their current and potential tourism significance, namely the Lichtenburg Vakansie Oord, the Lichtenburg Game Breeding Centre and the Rafters Pub (VR 62, VR 64 and VR 14 respectively). The Lichtenburg Vakansie Oord is situated approximately 3.6km south-east of the proposed 132kV power line corridor, adjacent to the Lichtenburg Game Breeding Centre, and is an ideal place for relaxation, adventure and scenic beauty. This holiday resort is an attractive destination for tourists and people on vacation and offers accommodation in the form of equipped chalets (**Figure 16**) and camping facilities. Other facilities that can be found within the holiday resort include lapa facilities with a boma, an in-house warm pool, an outside pool with slides (**Figure 17**), a day resort with 90m “Supertube” and 45m “Lane-Racer”, and an Olympic swimming pool with shaded island (http://lichtenburgvakansieoord.co.za/index2.htm).

Figure 16: The tiled roof chalets that are found within the Lichtenburg Vakansie Oord

Figure 17: The outside swimming pool area with slides which is found within the Lichtenburg Vakansie Oord

In addition, a tower which looks out over the adjacent Lichtenburg Game Breeding Centre can also be found within the resort (**Figure 18**). Due to the relatively tall nature of this structure, it is likely that individuals standing on the lookout tower might have views of the proposed development. The area surrounding the holiday resort has maintained a relatively natural or scenic character, with transformation limited mainly to the holiday resort area itself. This is most likely due to the fact that the Lichtenburg Vakansie Oord is situated adjacent to the largely natural area of the Lichtenburg Game Breeding Centre. It should however be noted that certain anthropogenic elements, such as telephone poles and a large cement factory (**Figure 19**), can be seen from within the holiday resort and are expected to lessen the visual sensitivity of the surrounding area. Although the above-mentioned cement factory is situated outside of the visual assessment zone, it is still expected to alter the visual character of the views from the Lichtenburg Vakansie Oord and will ultimately lessen the visual impact associated with the proposed development.

Figure 18: Lookout Tower found in the Lichtenburg Vakansie Oord which looks out over the adjacent Lichtenburg Game Breeding Centre

Figure 19: Large cement factory which can be seen from inside the Lichtenburg Vakansie Oord

The Lichtenburg Game Breeding Centre (VR 64) has maintained a largely natural character (**Figure 20)**. It should however be noted that a series of telephone poles can be found throughout the game breeding centre. In addition, other existing linear elements, such as a large cement factory and the tall steel structures that make up the Watersed MTS, are also visible from certain areas of the game breeding centre (**Figure 21**). The game breeding centre is also characterised by the presence of a wetland area which used to be home to unique animals such as the pygmy hippo and Pere David's deer.

Figure 20: View from one of the game drive routes in the Lichtenburg Game Breeding Centre showing the largely natural character of the area.

Figure 21: The tall steel structures of the Watershed MTS which can be seen from certain parts of the Lichtenburg Game Breeding Centre.

Part of the wetland area has been honed into a series of dams and pans that function as a haven for water birds. The centre also features one of the largest bird hides in the country and a network of game drive routes (http://www.sa-venues.com/game-reserves/nwp_lichtenburg.htm). The Lichtenburg Game Breeding Centre was therefore considered to be an attractive tourist destination and would be adversely affected by the visual intrusion of the proposed development should it be visible from this location. It is however important to note that at this stage, the game breeding centre is no longer operated by the National Zoological Gardens of South Africa and is currently not operational. During the site visit it was also noted that all wetland areas, dams and pans were completely dry and burning had taken place within these areas (**Figure 22**). It is estimated that the restoration and construction process of the game breeding centre will last another year, however there is currently no definite decision on whether or not the centre will be opened for tourists (Steynberg, 2016). Despite this, the Lichtenburg Game Breeding Centre has still been regarded as a sensitive visual receptor for the purpose of this study as the game breeding centre will be re-opened and could be operated as a tourism facility in the future.

Figure 22: View of one of the dried up wetland/dam/pan areas within the Lichtenburg Game Breeding Centre where burning has taken place.

The Rafters Pub (referred to as plots locally) has been operating on Portion 1 of the Farm Talene 25 for approximately eight years. It is estimated that the pub receives between 300 and 340 visitors per month and when special events (i.e. pool tournaments etc.) are hosted, the visitor numbers are higher. The owner of the farm has expressed his intention to start a bird breeding programme focused on African Greys on the farm. It is also the intention of the owner to offer overnight accommodation and build four chalets on the property (Steynberg, 2016). The owner of the farm has expressed his concern about the possible negative visual impact and the effect that the project could have on the potential for tourism development as well as the sense of place on his farm (Steynberg, 2016). In addition at the Landowner Focus Group Meeting held in March 2016, the owner expressed his concern regarding the possible impact that the proposed development would have on their existing business. Patrons visit their establishment to escape the town in order to experience the calm atmosphere and nature on the farm. As such, the farm is regarded as a sensitive visual receptor due to its current economic activities which in part rely on the scenic nature of the surrounding area and due to the future potential of the farm as a tourism facility.

During the site visit, several scattered farmsteads / homesteads were identified within the study area. These dwellings are located within a mostly rural or pastoral setting and the proposed development will likely alter the natural vistas experienced from these dwellings. It is important to

note that these visual receptor locations are regarded as potentially sensitive to the proposed development as the degree of visual impact experienced from these locations will vary from one inhabitant to another, as it is largely based on the viewer's perception and sentiments toward the development. Factors influencing the degree of visual impact experienced by viewers at these locations include the following:

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

Only three (3) sensitive visual receptor locations were identified within the rural parts of the study area, these being the Lichtenburg Game Breeding Centre (VR 64) which occupies a large tract of land directly east of the proposed 132kV power line corridor, the Lichtenburg Vakansie Oord (VR 62) which can be found to the south-east of the proposed 132kV power line corridor, adjacent to the game breeding centre and the Rafters Pub which is located adjacent to the application site for the PV energy facility directly south-west of the power line corridor. This is mainly due to low levels of leisure-based or nature based tourism activities in the assessment area. In addition, the only significant concentration of human habitation in the study area is the agricultural town of Lichtenburg, most of which lies outside the 5km assessment area. The northern sector of Lichtenburg which lies just inside the assessment area largely comprises of a mix of land uses with some receptors present. Although there is a relatively high concentration of receptors in this area, they are not all regarded as sensitive to the visual impact of the proposed development due to the existing visual degradation within these areas.

A list of the visually sensitive and potentially sensitive receptor locations (including coordinates) that were identified during the investigation are provided in **Appendix B**.

In many cases, roads, along which people travel, are considered to be sensitive receptor locations. The R505 main road which traverses the study area is considered to be a visually sensitive road as it is the main access road between Lichtenburg and the N18 national route to the north. This road can be used to access tourism attractions to the north of the study area such as the diamond diggings at Bakerville and the Wondergat sinkhole (http://www.tourismnorthwest.co.za). The relatively high volumes of motorists travelling along this road would therefore be visually exposed to the proposed power line and substation as the road traverses the power line corridor.

Table 2 below provides details of the sensitive visual receptor locations and roads that were identified within the study area.

Table 2: Visual receptor locations sensitive to the proposed on-site Tlisitseng 1 Substation and 132kV power line

Name	Distance from the proposed Tlisitseng 1 Substation site or 132kV power line corridor route	Visual Impact Zone
VR 62 – Lichtenburg Vakansie Oord	Approximately 3.7km	Low
VR 64 – Lichtenburg Game Breeding Centre	Approximately 1.5km	Moderate
VR 14 – Rafters Pub	Approximately 445m	High
R505 Secondary Road	Varies (directly traverses the power line corridor at the closest point)	Varies (High, Moderate and Low)

Other thoroughfares in the study area are primarily used by local farmers travelling to and from Lichtenburg. They are therefore not regarded as visually sensitive as they do not form part of any scenic tourist routes, and are not specifically valued or utilised for their scenic or tourism potential.

The sensitive / potentially sensitive visual receptor locations in relation to the zones of visual impact are indicted in **Figure 23** below.

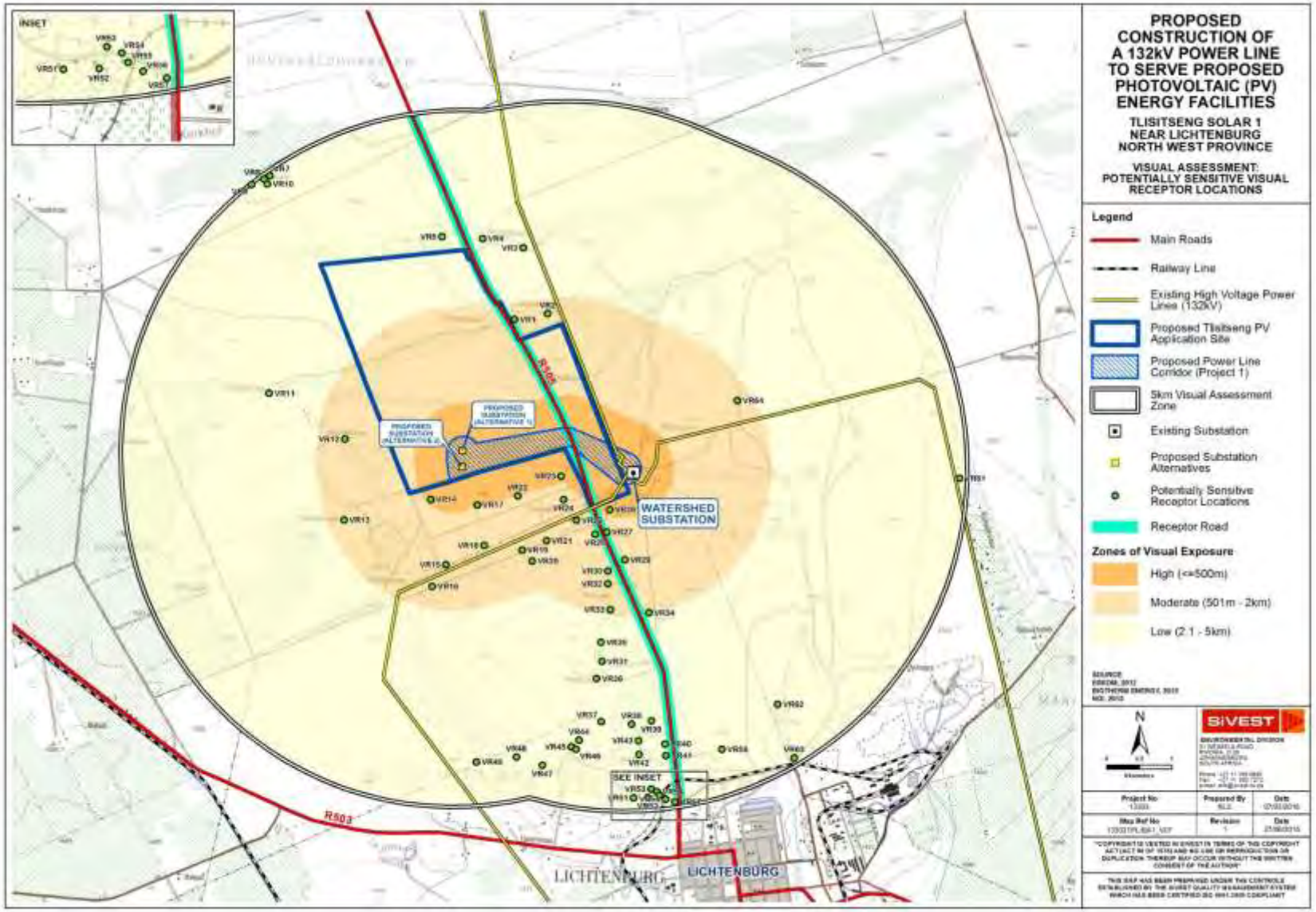

Figure 23: Visually sensitive receptors within the study area

3 TYPICAL VISUAL IMPACTS ASSOCIATED WITH ON-SITE SUBSTATIONS AND POWER LINES

In this section, the typical visual issues / impacts related to the establishment of an on-site substation and 132kV power line as proposed are discussed.

Power line towers and on-site substations are by their nature very large objects and thus highly visible. The standard tower height of the proposed 132kV power line is approximately 28m (equivalent in height to a 9 storey building). Although pylon structure would be less visible than a building, the height of a tower / pylon thus means that the pylon would still typically be visible for a relatively large radius around it. A 132kV power line consists of a series of towers spaced approximately 250m to 400m apart in a linear alignment, thus increasing its visibility.

The degree of visibility of an object informs the level and intensity of the visual impact, but other factors also influence the nature of the visual impact. The landscape and aesthetic context of the environment in which the object is placed, as well as the perception of the viewer are also important factors. In the context of the 132kV power line, the type of tower used as well as the degree to which the towers would impinge upon or obscure a view is also a factor that will influence the experience of the visual impacts.

As described above, power lines and substations are not features of the natural environment, but are rather representative of human (anthropogenic) alteration of the natural environment. Thus when placed in a largely natural landscape, a substation and/or power line can be perceived to be highly incongruous in this context. The height and linear nature of the power line will exacerbate this incongruity within a natural landscape, as the towers may impinge on views within the landscape. In addition, the practice of clearing the taller vegetation under the power line servitude in certain vegetation types can worsen the visibility and incongruity of the power line in a largely natural bushier setting, by causing fragmentation of natural vegetation, thus making the power line more visible. The cleared strip of land is often highly visible and draws the viewer's attention to the power line servitude, especially when it occurs within a context of natural thicket / bushveld vegetation where bushes or trees commonly occur.

As mentioned above, how the viewer / receptor perceives the impact is also very important, as certain receptors may not consider the development of a substation and/or power line to be a visual impact. The scenic / aesthetic value of an area, and the types of land use practices also tend to affect people's perception of whether a substation and/or power line is an unwelcome intrusion, and thus the sensitivity of receptors to the erection of a substation and/or power line in an area. Power lines and substations are often perceived as visual impacts where value is placed on the scenic or aesthetic character of an area, and where activities, which are based upon the enjoyment of, or exposure to, the scenic or aesthetic features of the area are practiced. Sensitivity to visual

impacts is typically most pronounced in areas set aside for conservation of the natural environment (such as protected natural areas or conservancies), or in areas in which the natural character or scenic beauty of the area attracts visitors (tourists) to the area. Residents and visitors to these areas may perceive substations and/or power lines to be an unwelcome intrusion that would degrade the natural character and scenic beauty of the area, and which would potentially even compromise the practicing of tourism activities in the area.

Conversely, the presence / existence of other anthropogenic objects associated with the built environment may influence the perception of whether a substation and/or power line is a visual impact. Where buildings and other linear structures such as roads, railways and especially other power lines and substations exist the visual environment could be considered to be “degraded” and thus the introduction of a new power line and substation in this setting may be considered to be less of a visual impact if there was no existing built infrastructure visible.

Other factors, as listed below, can also impact the nature and intensity of a potential visual impact associated with a substation and power line:

- The location of a substation and power line in the landform setting – i.e. in a valley bottom or on a ridge top. In the latter example the substation and/or power line would be much more visible and would “break” the horizon;
- The presence of macro- or micro-topographical features, such as buildings or vegetation that would screen views of the substation and power line from a receptor location;
- The presence of existing substations and power lines in the area and alignment in relation to these substations and power lines; and
- Temporary factors such as weather conditions (presence of haze, or heavy mist) which would affect visibility.

4 IMPACT ASSESSMENT

4.1 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. The 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.

As previously mentioned, the proposed development includes the construction of a 132kV on-site substation (namely the Tlisitseng 1 Substation), a 132kV power line and associated infrastructure which are aimed at feeding the electricity generated by the proposed Tlisitseng 1 solar PV energy facility (part of separate on-going EIA process) back into Eskom's national grid. In general, the development would not be consistent with the prevailing residential and pastoral land use within the surrounding area. However, the anthropogenic elements and built-up areas present within parts of the study area are expected to lessen the degree to which the proposed development would be considered incongruent with the surrounding landscape. As mentioned above, the presence of other linear and vertical structures such as roads, railways and especially other power lines and substations would influence the perception of whether a power line and substation would visually contrast with the elements already present within the landscape. Where existing electrical infrastructure is present the visual environment would already be visually 'degraded' and thus the introduction of a new power line or substation in this setting would result in less visual contrast than if no existing built infrastructure were visible.

The existing electrical infrastructure within the study area, includes three (3) high voltage power lines and Watershed MTS. These elements have already degraded the natural environment to some extent and will significantly reduce the visual impact as the proposed development would conform with these elements. It is also important to note that the on-site substation and power line are being proposed to serve the Tlisitseng 1 solar PV energy facility. Thus, the substation and power line would only be constructed if the PV energy facility was developed as well. The visual contrast would therefore be dwarfed by the large number of visible PV panels. As such, the substation and power line are not expected to result in a significant visual contrast.

4.2 Receptor Impact Rating

In order to assess the potential visual impact of the proposed development on the sensitive / potentially sensitive receptor locations identified during the field investigation, a matrix that takes into account a number of factors has been developed (**Table 3**), and is applied to each receptor location.

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

- Distance of receptor away from the proposed development (distance banding)
- Presence of potential screening factors (topography, vegetation etc.)
- Location of the receptor in terms of zones of visual contrast

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

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

	VISUAL IMPACT RATING			
VISUAL FACTOR	**HIGH**	**MEDIUM**	**LOW**	**OVERRIDING FACTOR: NIL**
Distance of receptor away from proposed development	0 < 500m **Score: 3**	500m < 2km **Score: 2**	2km < 5km **Score: 1**	5km <
Presence of screening factors	Limited or no screening factors – development highly visible **Score: 3**	Screening factors likely to partially obscure the development **Score: 2**	Screening factors likely to 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
Zone of 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. the outskirts of urban and built-up areas). **Score: 1**	

4.2.1 Distance

As described above, distance of the viewer / receptor location away from the development is an important factor in the context of experiencing of visual impacts. A high impact rating has thus been assigned to receptor locations that are located within 0<500m of the proposed development. Beyond 5km, the visual impact would be virtually nil, as the development would appear to merge with the elements on the horizon. Any receptor location beyond this distance has therefore been assigned an overriding nil impact rating. As such, despite the impact rating assigned to the other visual factors, the overall impact rating would remain nil, as the proposed development would not visually influence any receptors located more than 5km from the development. Where a receptor is located within more than one distance band, such as a receptor road, it is assigned the score according to the closest distance it will get from the proposed development i.e. the highest visual impact experienced.

As previously mentioned, distance bands were used to assign zones of visual impact from the proposed development site. Based on the height and scale of the project, as well as the investigations undertaken during the fieldwork, the radii chosen to assign the zones of visual impact are as follows:

- 0 < 500m (high impact zone);
- 500m < 2km (moderate impact zone); and
- 2km < 5km (low impact zone).

4.2.2 Screening factors

The presence of screening factors is equally important in this context as the distance away from the development. Screening factors can be vegetation, buildings, as well as topography. For example, a grove of trees located between a receptor location and an object could completely shield the object from the receptor location. Topography (relative elevation and aspect) plays a similar role as a receptor location in a deep or incised valley will have a very limited viewshed and may not be able to view an object that is in close proximity, but not in its viewshed. As such, the complete screening of the development has also been assigned an overriding nil impact rating, as the development would not impose any impact on the receptor.

4.2.3 Zones of visual contrast

The degree to which the proposed development would appear to contrast with the surrounding land use, settlement density, forms and patterns of elements that define the structure of the surrounding landscape is also considered in the matrix. The visual contrast is an important factor to be considered when assessing the impact of the proposed development from a specific location, as a development that appears contrasts with the visual backdrop may change the visual character of that landscape. This could have a significant visual impact on potentially sensitive visual receptors within the study area.

Based on the land use and visual character in the surrounding landscape, the area was assessed to determine the level of transformation and degree to which the proposed development would appear to be visually compatible with the surrounding environment when viewed from a particular location. In the context of this proposed development, the presence or absence of existing electrical infrastructure, dense settlement or other urban built-up form is an important factor influencing the level of visual contrast. For example, if the development was located adjacent to an existing substation or power line it would result in significantly less visual contrast. The development site was therefore classified into the following zones of visual contrast:

- **High** – undeveloped / natural / rural areas;
- **Moderate** – Intensive agricultural lands / cultivated fields or areas within 500m of existing power line, road or rail infrastructure in undeveloped / natural / rural area; and
- **Low** – within 1km from visually transformed urban / built-up areas.

The outcome of the visual contrast classification in relation to the sensitive / potentially sensitive visual receptor locations is provided in **Figure 24** below.

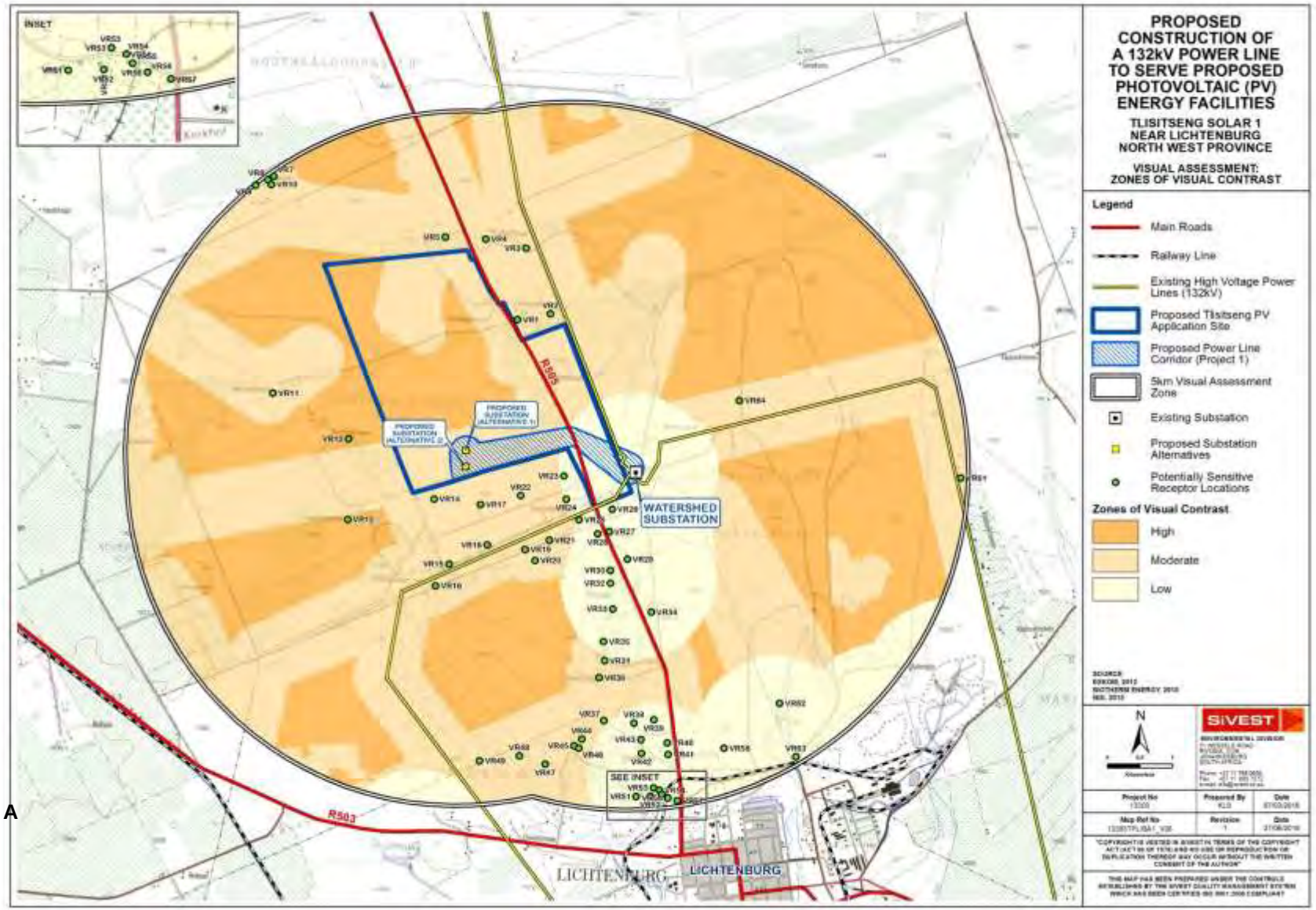

Figure 24: Zones of visual contrast

Table 4 below presents the results of the visual impact matrix

Categories of impact:

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

Table 4: Visual impact of the proposed development on sensitive / potentially sensitive visual receptors within the study area

Receptor Location	Distance	Screening	Contrast	OVERALL IMPACT RATING
VR 1	Moderate (2)	High (3)	Moderate (2)	**MODERATE**
VR 2	Moderate (2)	Moderate (2)	Moderate (2)	**MODERATE**
VR 3	Low (1)	High (3)	Moderate (2)	**MODERATE**
VR 4	Low (1)	Low (1)	Moderate (2)	**LOW**
VR 5	Low (1)	Low (1)	Moderate (2)	**LOW**
VR 7	Low (1)	Low (1)	Moderate (2)	**LOW**
VR 8	Low (1)	Moderate (2)	Moderate (2)	**MODERATE**
VR 9	Low (1)	Low (1)	Moderate (2)	**LOW**
VR 10	Low (1)	Low (1)	Moderate (2)	**LOW**
VR 11	Low (1)	Moderate (2)	Moderate (2)	**MODERATE**
VR 12	Moderate (2)	Moderate (2)	High (3)	**MODERATE**
VR 13	Moderate (2)	Moderate (2)	High (3)	**MODERATE**
VR 14 – Rafters Pub	High (3)	Moderate (2)	Moderate (2)	**MODERATE**
VR 15	Moderate (2)	Moderate (2)	Moderate (2)	**MODERATE**
VR 16	Moderate (2)	Moderate (2)	Moderate (2)	**MODERATE**
VR 17	High (3)	Low (1)	Moderate (2)	**MODERATE**
VR 18	Moderate (2)	Low (1)	Moderate (2)	**MODERATE**
VR 19	Moderate (2)	Low (1)	Moderate (2)	**MODERATE**
VR 20	Moderate (2)	Low (1)	Moderate (2)	**MODERATE**
VR 21	Moderate (2)	Low (1)	Moderate (2)	**MODERATE**
VR 22	High (3)	Low (1)	Moderate (2)	**MODERATE**
VR 23	High (3)	Low (1)	Low (1)	**MODERATE**
VR 24	Moderate (2)	Low (1)	Low (1)	**LOW**
VR 25	Moderate (2)	Low (1)	Low (1)	**LOW**
VR 26	High (3)	Moderate (2)	Low (1)	**MODERATE**
VR 27	Moderate (2)	Low (1)	Low (1)	**LOW**

Receptor Location	Distance	Screening	Contrast	OVERALL IMPACT RATING
VR 28	Moderate (2)	Low (1)	Low (1)	**LOW**
VR 29	Moderate (2)	Negligible	Low (1)	**LOW**
VR 30	Moderate (2)	Low (1)	Low (1)	**LOW**
VR 31	Low (1)	Low (1)	Moderate (2)	**LOW**
VR 32	Moderate (2)	Low (1)	Low (1)	**LOW**
VR 33	Moderate (2)	Low (1)	Low (1)	**LOW**
VR 34 – Lichtenburg Drive-in Theatre	Moderate (2)	High (3)	Low (1)	**MODERATE**
VR 35	Low (1)	Low (1)	Low (1)	**LOW**
VR 36	Low (1)	Moderate (2)	Moderate (2)	**MODERATE**
VR 37	Low (1)	Low (1)	Moderate (2)	**LOW**
VR 38	Low (1)	High (3)	Low (1)	**MODERATE**
VR 39	Low (1)	High (3)	Low (1)	**MODERATE**
VR 40	Low (1)	Low (1)	Low (1)	**LOW**
VR 41	Low (1)	High (3)	Low (1)	**MODERATE**
VR 42	Low (1)	Low (1)	Low (1)	**LOW**
VR 43	Low (1)	Moderate (2)	Low (1)	**LOW**
VR 44	Low (1)	Moderate (2)	Moderate (2)	**MODERATE**
VR 45	Low (1)	Low (1)	Moderate (2)	**LOW**
VR 46	Low (1)	Low (1)	Moderate (2)	**LOW**
VR 47	Low (1)	Low (1)	Moderate (2)	**LOW**
VR 48	Low (1)	Low (1)	Moderate (2)	**LOW**
VR 49	Low (1)	High (3)	Moderate (2)	**MODERATE**
VR 51	Low (1)	Moderate (2)	Low (1)	**LOW**
VR 52	Low (1)	Low (1)	Low (1)	**LOW**
VR 53	Low (1)	Low (1)	Low (1)	**LOW**
VR 54	Low (1)	Moderate (2)	Low (1)	**LOW**
VR 55	Low (1)	Low (1)	Low (1)	**LOW**
VR 56	Low (1)	Low (1)	Low (1)	**LOW**
VR 57	Low (1)	Moderate (2)	Low (1)	**LOW**
VR 58	Low (1)	High (3)	Low (1)	**MODERATE**
VR 62 – Lichtenburg Vakansie Oord	Low (1)	Moderate (2)	Low (1)	**LOW**
VR 63	Low (1)	Low (1)	Low (1)	**LOW**

Receptor Location	Distance	Screening	Contrast	OVERALL IMPACT RATING
VR 64 – Lichtenburg Game Breeding Centre	Moderate (2)	Moderate (2)	Moderate (2)	**MODERATE**

As indicated above, the proposed development would result in a low visual impact on majority of the potentially sensitive visual receptor locations with the study area (32 in total). It is important to note that the proposed development would result in a moderate visual impact on the Lichtenburg Game Breeding Centre (VR 64) and Rafters Pub (VR 14) and have a low visual impact on the Lichtenburg Vakansie Oord (VR 62). Although the development would be visible (to a degree) from all of the potentially sensitive / sensitive visual receptor locations, it would not result in a high impact on any of the potentially sensitive receptor locations. In addition, the proposed development is likely to exert a moderate impact on twenty five (25) of the potentially sensitive visual receptor locations.

4.3 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 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 on-site Tlisitseng 1 Substation at night.

The area surrounding the proposed development site is mostly uninhabited and as a result, relatively few light sources are present. The town of Lichtenburg is the main source of light within the surrounding area, however it is located more than 6km away and are therefore expected to have a limited impact on the night scene. It must be noted that the Lichtenburg Game Breeding Centre, Lichtenburg Vakansie Oord and Lichtenburg Drive-in Theatre can be found within relatively close proximity to the application site and will most likely require some form of lighting for security reasons. At this stage, it is uncertain whether the Lichtenburg Drive-in Theatre is still operational and the impact of it on the night scene. It should also be noted that majority of the Lichtenburg Game Breeding Centre has maintained a largely natural / undisturbed character as it was used to breed animals for local and international zoos. The natural / undisturbed areas within the breeding centre are therefore not expected to be characterised by a large amount of lighting. The Lichtenburg Vakansie Oord is however expected to be illuminated at night and require lighting for security

reasons as it is used as a holiday resort and offers accommodation and recreational facilities. In addition, another prominent light source within the study area at night is the security lighting at the Eskom Watershed MTS which the power lines are proposed to connect to. According to local farmers, the Watershed MTS can be seen at night from relatively far away. Other sources of light are limited to, isolated lighting from the surrounding farmsteads and residential dwellings. In general the study area is characterised by a picturesque dark starry sky and the visual character of the night environment is considered to be generally 'unpolluted' and pristine.

Due to the fact that the larger area is generally renowned as a tourist destination, the relatively natural dark character of the nightscape will be sensitive to the impact of additional lighting at night, particularly from nearby farmhouses. The security lighting required for the proposed project is likely to intrude on the nightscape and create glare, which will contrast with the dark backdrop of the surrounding area. Existing night time views from potentially sensitive receptors are characteristic of a relatively dark night scene with some light sources visible in the distance as well as those from the nearby Watershed MTS and Lichtenburg Vakansie Oord, as a result lighting impacts from the proposed substation will increase the existing light pollution in the surrounding area.

4.4 Visual Impact Summary

4.4.1 Access Roads

A network of gravel access roads will also be constructed to provide access to the power line. Roads are typically only associated with significant visual impact if they traverse sloping ground on an aspect that is visible to the surrounding area. Considering the flat nature of the terrain on the site, it is likely that the visual impact associated with these roads would be limited to the impact of clearing the vegetation. However, if these roads are not maintained correctly during the construction phase, construction vehicles travelling along the gravel access roads could expose surrounding farmstead to dust plumes.

4.4.2 Power Line

As previously mentioned, one (1) power line corridor is being assessed in order to provide grid access from the proposed 132kV on-site Tlisitseng 1 Substation to Eskom's Watershed MTS (**Figure 25**). The proposed power line corridor has been aligned to traverse the R505 in a south-eastern direction towards the Watershed MTS. Here it will join up with three (3) existing 132kV power lines. It must however be noted that the proposed power line corridor is aligned within a part of the study area which is not characterised by existing electrical infrastructure and has remained largely natural (**Figure 26**). The tall steel structures that make up the Watershed MTS are however visible from parts of the proposed power line corridor.

Figure 25: View of the Watershed MTS

Figure 26: View from the proposed power line corridor showing the largely natural character of the area. The tall steel structures that make up the Watershed MTS are however visible from parts of the power line corridor

Power lines are anthropogenic elements that are typically found in the landscape, both in urban or industrial and in more natural rural settings. The visual impact of a power line would largely be related to the physical characteristics of the area, land use and the spatial distribution of potential receptors. When combining this with the distribution and likely value judgements of visual receptors, the visual impact of the proposed power line can be determined. In areas, where the power line would contrast with the surrounding area it may change the visual character of the landscape and be perceived negatively by visual receptors.

A summary of the visual impact of the proposed power line corridor in relation to the physical characteristics, land use, visual character, presence of visual receptors and existing power lines or other infrastructure in the surrounding landscape, are discussed in **Table 5** below. These factors have been investigated in order to determine the degree to which the proposed power line corridor would be visually compatible with the surrounding environment and to determine its overall visual impact.

Table 5: Visual impact summary of the proposed power line corridor in relation to surrounding environment

Physical and Land Use Characteristics	Visual Character	Visual Contrast	Presence of Visual Receptors	Overall Visual Impact
Topography: The proposed power line would typically be highly visible due to the very flat terrain and wide-ranging vistas in the study area. Localised topographical undulations would offer minimal visual screening. **Vegetation:** The predominant very low shrub layer and open areas of cultivated fields / grasslands results in wide-open vistas across most of the study area. Only in areas where artificial wooded vegetation has been established around farmhouses, would the vegetation provide visual screening. **Land use:** Much of the assessment area is characterised by natural unimproved vegetation.	The area has a largely natural rural or pastoral visual character. The most prominent anthropogenic elements and built infrastructure in the study area include the R505 main road, gravel access roads, existing 132kV power lines, the Watershed MTS, the Lichtenburg Vakansie Oord, the Lichtenburg Game Breeding Centre, isolated farmhouses and other linear elements, such as telephone poles, communication poles, windmills and farm boundary fences.	Although the area is largely natural or rural / pastoral and the prevailing agricultural activities have left the vegetation mostly intact, the presence of the existing 132kV power lines have introduced a distinct linear element into the landscape. As such, the addition of a power line which would be aligned in close proximity to the existing power lines would contrast moderately with the existing linear elements. However, the presence of the proposed Tlisitseng solar 1 PV energy facilities (part of separate on-going EIA process) would lessen the visual contrast.	Potentially sensitive visual receptors within viewing distance (5km) from the power line corridor are limited to approximately fifty six (56) scattered farmsteads and one (1) Drive-in Theatre. In addition, three (3) receptor locations, namely VR 62 – The Lichtenburg Vakansie Oord, VR 64 – The Lichtenburg Game Breeding Centre and VR 14 – Rafters Pub, were deemed to be sensitive receptors due to their significance as tourism facilities. It must be noted that a significant number of the farmsteads identified are located within 2km from the power line corridors. From these distances the visual impact associated	Due to the large number of visual receptors present within viewing distance from the proposed power line corridors, and the fact that the alignment runs in close proximity to existing 132kV power lines, the power line would result in a medium visual impact. Refer to **Section 4.5** for the overall visual impact rating.

Cultivated land is largely concentrated on the western boundary of the study area, with smaller, scattered patches of cultivation evident throughout the study area. The power line would contrast within this setting.			with the power line is expected to be significant.	

4.4.3 On-site Substation

A new 132kV on-site substation (namely the Tlisitseng 1 Substation) is being proposed in order to supply the electricity generated by the proposed Tlisitseng 1 solar PV energy facility (part of separate on-going EIA process) to Eskom's national grid. In isolation, the proposed Tlisitseng 1 Substation may be considered to be visually intrusive; however, it must be assumed that the on-site substation would be built to serve the needs of the power generated from the proposed Tlisitseng 1 solar PV energy facility. Thus the substation would only be constructed if the proposed PV energy facility was developed as well. The substation would likely form part of the PV complex, as viewed from the surrounding farmsteads. Views of the substation would therefore be dwarfed by the large number of PV panels that would be visible. As such, the substation is not expected to be associated with a significant visual impact, or even a measurable cumulative impact.

4.5 Cumulative Impacts

Although it is important to assess the visual impacts of the proposed development on its own, it is equally important to assess the cumulative visual impact that could materialise in the area should other similar developments be granted authorisation to proceed. Cumulative impacts are the impacts, which combine from different developments / facilities and result in significant impacts that may be larger than sum of all the impacts.

It is important to note that onsite substation and power line developments are associated with other renewable energy facility developments such as solar PV energy facilities. Onsite substation and power line developments are proposed in order to supply electricity generated by their associated renewable energy facility developments to the national grid. As such, most onsite substation and power line developments proposed in the area would only be constructed should their associated renewable energy facilities be granted EA and ultimately be constructed / developed as well. The cumulative impacts associated with the substation and power line developments are therefore intrinsically linked to those identified for renewable energy facility developments and the impacts cannot be separated. The literature review undertaken for the two (2) proposed Tlisitseng PV energy facilities has therefore been utilised to assess the cumulative impact in the area.

The area has seen some interest from developers of various renewable energy projects, which is likely associated with the solar energy resource potential found in the region, proximity to the existing sub-station and its evacuation capacity, as well as other factors. Such developments, whether already approved or only proposed, need to be considered as they have the potential to create numerous cumulative impacts, whether positive or negative, if implemented.

These renewable energy developments and their potential for large scale visual impacts could significantly alter the sense of place and visual character in the study area, if constructed. For the purpose of this study, renewable energy developments which are proposed within a 30km radius from the Tlisitseng 1 substation and 132kV power line were identified.

Table 6 lists the projects that will need to be considered when examining the cumulative impacts.

Table 6: Renewable energy developments proposed within a 30km radius from the Tlisitseng 1 Substation site and 132kV Power Line Corridor

Proposed Development	DEA Reference Number	Current Status of EIA	Proponent	Proposed Capacity	Farm Details
Tlisitseng Solar 1 PV Energy Facility	14/12/16/3/3/2/889	EIA ongoing	BioTherm Energy	75MW	Portion 25 of the Farm Houthaalboomen No 31
Tlisitseng Solar 2 PV Energy Facility	14/12/16/3/3/2/890	EIA ongoing	BioTherm Energy	75MW	Portion 25 of the Farm Houthaalboomen No 31
Lichtenburg Solar Park	14/12/16/3/3/3/270	Project has received environmental authorisation	Matrigenix (Pty) Ltd	70MW	A portion of portion 10 of the Farm Lichtenburg Town and Townlands No. 27
Watershed Solar Energy Facility Phase 1	14/12/16/3/3/2/556	Project has received environmental authorisation	FVR Energy South Africa (Pty) Ltd	75MW	Portions 1, 9, 10 and 18 of the Farm Houthaalboomen No. 31
Watershed Solar Energy Facility Phase 2	14/12/16/3/3/2/557	Project has received environmental authorisation	FVR Energy South Africa (Pty) Ltd	75MW	Portions 1, 9, 10 and 18 of the Farm Houthaalboomen No. 31
Hibernia PV Solar Energy Facility	14/12/16/3/3/2/1062	Project has received environmental authorisation	Megawatt One Photovoltaic (Pty) Ltd	5MW	Portions 9 and 31 of the Farm Hibernia No. 52

Based on the Department of Environmental Affairs' (DEAs) comments on the Draft Basic Assessment Report (DBAR), the DEA requested that a cumulative environmental impact assessment be conducted including a literature review of other specialist assessments / studies on the neighbouring adjacent properties for other similar developments in a 30km radius of the project site. This is to be undertaken in order to ascertain any additional cumulative impacts associated with the other developments in general..

In an effort to meet this requirement, SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMPr Reports) for the above mentioned developments. The steps taken to acquire the relevant documents for the above mentioned projects is detailed in **Table 7** below.

Table 7: Proposed renewable energy projects in the area, steps taken to obtain the relevant information and documents obtained.

Proposed Development	EAP	Steps taken to obtain relevant documents	Documents Obtained
Tlisitseng Solar 1 PV Energy Facility	SiVEST SA (Pty) Ltd	SiVEST is the EAP for the proposed development. The proposed development Final Scoping Report (FSR) has been accepted by the DEA and the Final Environmental Impact Assessment Report (FEIAr) has been submitted to the DEA for decision making. Additionally, the specialist impact assessments have been conducted to form part of the FEIAr. All the relevant documents were therefore available for the cumulative assessment.	▪ Biodiversity Impact Assessment Report; ▪ Avifaunal Impact Assessment Report; ▪ Surface Water Impact Assessment Report; ▪ Soils and Agricultural potential Impact Assessment Report; ▪ Visual Impact Assessment Report; ▪ Heritage Impact Assessment Report; ▪ Socio-economic Impact Assessment Report; ▪ Geotechnical Impact Assessment Report; and ▪ Traffic Impact Assessment Report

Tlisitseng Solar 2 PV Energy Facility	SiVEST SA (Pty) Ltd	SiVEST is the EAP for the proposed development. The proposed development FSR has been accepted by the DEA and the FEIAr has been submitted to the DEA for decision making. Additionally, the specialist impact assessments have been conducted to form part of the FEIAr. All the relevant documents were therefore available for the cumulative assessment.	▪ Biodiversity Impact Assessment Report; ▪ Avifaunal Impact Assessment Report; ▪ Surface Water Impact Assessment Report; ▪ Soils and Agricultural potential Impact Assessment Report; ▪ Visual Impact Assessment Report; ▪ Heritage Impact Assessment Report; ▪ Socio-economic Impact Assessment Report; ▪ Geotechnical Impact Assessment Report; and ▪ Traffic Impact Assessment Report
Lichtenburg Solar Park	Africa Geo-Environmental Services (AGES)	▪ Google Search for PV facilities near Lichtenberg North West Province; ▪ Proposed Development was found on Leads 2 Business website (www.l2b.co.za/project-region/**North-West**). ▪ Google search of the proposed development project name was undertaken. ▪ Consulted the SAHRA Website for Heritage and PIA Report (http://sahra.org.za/sahris/cases/lichtenburg-solar-park). ▪ Attempted to download reports from the AGES Website (http://ages-group.com/) o Reports were not available for publically available to download ▪ Contacted AGES in an effort to obtain outstanding specialist reports that were not available for public download.	▪ Archaeological Impact Assessment Report ▪ Heritage Impact Assessment Report

		○ AGES responded to SiVEST request for the FBAR and specialist reports noting that the proposed development has not been awarded preferred Bidder Status in terms on the DoE's IPP programme. ○ AGES further stated that they are not in a position to send any of the reports through to SiVEST. However, they were able to provide SiVEST with the locality map for the proposed Lichtenburg Solar Park as well as layout plans. ▪ Additionally, SiVEST attempted to contact the developers of the proposed development, however contact details were not publically available.	
Watershed Solar Energy Facility Phase 1 Watershed Solar Energy Facility Phase 2	Savannah Environmental (Pty) Ltd Savannah Environmental (Pty) Ltd	▪ Google Search for PV facilities near Lichtenberg North West Province; ▪ The proposed Development was found on Leads 2 Business website (www.l2b.co.za/project-region/**North-West**). ▪ Google search of the proposed development project name was undertaken. FEIR (excluding appendices) was able to be downloaded as a PDF. ▪ Consulted the SAHRA Website for Heritage Report (http://sahra.org.za/sahris/heritage-reports/heritage-report-watershed-solar-facility). ▪ From the SAHRA website other documents were available to be downloaded. (http://sahra.org.za/sahris/cases/watershed-solar-energy-facilities-556-557). ▪ Attempted to download reports from the Savannah Environmental Website ○ Reports were not publically available to download.	▪ Watershed PV (phase I and II) FEIR ▪ Visual Scoping Report ▪ Social Scoping report ▪ Draft EMPr (Phase 1) ▪ Draft EMPr (Phase 2) ▪ Archaeological Impact Assessment Report ▪ Background Information Documents ▪ EAs

		▪ Contacted Savannah Environmental in an effort to obtain outstanding specialist reports that we not available for public download. o Savannah Environmental noted that the project has already been archived and handed over to the developers. o Savannah Environmental noted that it is against their company policy to give out developers contact details. However, they were able to provide SiVEST with the EA's for the proposed development.	
Hibernia PV Solar Energy Facility	Savannah Environmental (Pty) Ltd	▪ Google Search for PV facilities near Lichtenberg North West Province; ▪ The proposed Development was found on Leads 2 Business website (www.l2b.co.za/project-region/**North-West**). ▪ Google search of the proposed development project name was undertaken. BID was able to be downloaded as a PDF. ▪ Consulted the SAHRA Website for Heritage Report (http://sahra.org.za/sahris/heritage-reports/aia-paleo-reports-hibernia). ▪ From the SAHRA website other documents were available to be downloaded. FEIR (excluding appendices) was able to be downloaded as a PDF. http://sahra.org.za/sahris/cases/hibernia-solar-facility-1062). ▪ Attempted to download reports from the Savannah Environmental Website o Reports were not publically available to download	▪ Heritage Assessment Report ▪ Final BAR ▪ BID

		▪ Contacted Savannah Environmental in an effort to obtain outstanding specialist reports that we not available for public download. o Savannah Environmental noted that the project has already been archived and handed over to the developers. o Savannah Environmental noted that it is against their company policy to give out developers contact details. However, they were able to provide SiVEST with the EA's for the proposed development. ▪ Additionally, SiVEST attempted to contact the developers of the proposed development, however contact details were not publically available.	

In response to the DEA's request, a literature review of other visual impact assessments / studies compiled for the renewable energy facilities in the area was subsequently undertaken. It should be noted that some of the project sites are at a very advanced stage, and the initial studies were undertaken in 2012. As a result, many of the documents are not currently publically available to download. Nonetheless, SiVEST was able to source some of information that was available. The relevant information (including visual impact specialist studies, EIA / Scoping and EMPr Reports) that could be obtained for the surrounding proposed renewable energy developments that was taken into account is shown in **Table 8** below.

Table 8: Literature Review of Visual Impacts for Surrounding Renewable Energy Developments

Project	Relevant Impacts to be Taken into Consideration from a Visual Perspective	Proposed Mitigation Measures	Impacts Significance Rating after Mitigation
Tlisitseng Solar 1 PV Energy Facility	▪ The following visual impacts are expected during the construction of the proposed PV energy facility and associated infrastructure: 1) Large construction vehicles and equipment during the construction phase will alter the natural character of the study area and expose visual receptors to visual impacts associated with the construction phase. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. In addition, vehicles and trucks travelling to and from the proposed site on gravel access roads would increase dust emissions.	▪ The following mitigation measures are recommended: - Carefully plan to reduce the construction period. - 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. - Ensure that dust suppression techniques	▪ The visual impacts expected during the construction of the proposed PV energy facility and associated infrastructure will be negative low after the implementation of mitigation measures; ▪ The cumulative visual impacts expected as a result of the other proposed renewable energy developments and their associated infrastructure during construction will be negative low after the implementation of mitigation measures; ▪ The visual impacts expected during the operation of the proposed PV energy facility will be medium

	The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. The visual intrusion of the construction activities could adversely affect farmsteads / homesteads within the visual assessment zone, motorists travelling along the R505 and visitors at Rafters Pub and the Lichtenburg Game Breeding Centre. Surface disturbance during construction would also expose bare soil which could visually contrast with the surrounding environment. Additionally, temporarily stockpiling soil during construction may alter the generally flat landscape. Wind blowing over these disturbed areas could therefore result in dust which would have a visual impact. The clearing of vegetation will be required for the installation of the PV panels. This is also expected to result in the generation of dust, alter the natural character of the surrounding area and	are implemented on gravel access roads, where possible. - Ensure that dust suppression is implemented in all areas where vegetation clearing has taken place. - Ensure that dust suppression techniques are implemented on all soil stockpiles. - Re-vegetate all reinstated cable trenches with the same vegetation that existed prior to the cable being laid. - Temporarily fence-off the construction site (for the duration of the construction period). - Establish erosion control measures on areas which will be exposed for long periods of time. This is to reduce the potential impact heavy rains may have on the bare soil. - Light fittings for security at the PV energy facility and proposed substation at night should reflect the light toward the ground and prevent light spill. - As far as possible, limit the amount of security	negative after the implementation of mitigation measures; ▪ The visual impacts expected during the operation of the infrastructure associated with the proposed PV energy facility will be low negative after the implementation of mitigation measures; and ▪ The cumulative visual impacts expected as a result of the other proposed renewable energy developments and their associated infrastructure during operation will be medium negative after the implementation of mitigation measures.

	therefore create a visual impact. ▪ The following cumulative visual impacts are expected as a result of the other proposed renewable energy facilities and their associated infrastructure during construction: 1) The cumulative impacts during the construction phase will only be realised if the construction timelines of one or more of the nearby renewable energy facilities are aligned. Large construction vehicles and equipment during the construction phase of the other proposed renewable energy developments may further alter the natural character of the study area and expose visual receptors to visual impacts associated with the construction phase. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. In addition, vehicles and trucks travelling to and from the other proposed renewable energy facilities on gravel access roads could	and operational lighting present on site. - As far as possible, limit the number of maintenance vehicles which are allowed to access the site. - Ensure that dust suppression techniques are implemented on gravel access roads, where possible. - Only clear vegetation on site and adjacent to the site which is required to be cleared for the correct operation of the facility. - Ensure that the PV arrays are not located within 500m from any of the surrounding farmhouses, in order to limit the visual impact of the solar facility on these dwellings. - The O&M buildings should not be illuminated at night. - If overhead power lines are required, align power lines to run parallel to other linear elements and the farm boundaries, where possible. - Bury cables under the ground where possible. - The O&M buildings should be painted with natural tones that fit with	

	increase dust emissions. The increased traffic on the gravel roads and the dust plumes as a result of the other proposed renewable energy developments could create a larger visual impact and may evoke further negative sentiments from surrounding viewers. The visual intrusion of the construction activities associated with the other proposed renewable energy developments could adversely affect farmsteads / homesteads within certain visual assessment zones, motorists travelling along the R505 and visitors at identified sensitive visual receptors. Surface disturbance during construction of the other proposed renewable energy developments could also increase the exposure of bare soil which could increase the visual contrast with the surrounding environment. Additionally, temporarily stockpiling soil during construction may alter the generally flat landscape further. Wind blowing over these disturbed areas could therefore result in a	the surrounding environment. - Select the alternatives that will have the least impact on visual receptors - Ensure that dust suppression techniques are implemented on gravel access roads, where possible. - Non-reflective surfaces should be utilised where possible. - Ensure that the associated infrastructure are not located within 500m from any of the surrounding farmhouses, in order to limit the visual impact on these dwellings.	

	greater amount of dust which would have a larger visual impact. The clearing of vegetation will also be required during the construction of the other renewable energy facilities. This is expected to result in an increase in the generation of dust, alter the natural character of the surrounding area further and therefore create a greater visual impact. ▪ The following visual impacts are expected during the operation of the proposed PV energy facility: 1) The proposed Tlisitseng Solar 1 PV energy facility could exert a visual impact by altering the visual character of the surrounding area and exposing sensitive visual receptor locations to visual impacts. The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the PV energy facility via gravel access roads and are expected to		

	increase dust emissions in doing so. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Security and operational lighting at the proposed PV energy facility could result in light pollution and glare, which could be an annoyance to surrounding viewers. The visual intrusion of the proposed PV energy facility could adversely affect farmsteads / homesteads within the visual assessment zone, motorists travelling along the R505 and visitors at Rafters Pub and the Lichtenburg Game Breeding Centre. ▪ The following visual impacts are expected during the operation of the infrastructure associated with the proposed PV energy facility: 1) The infrastructure associated with the proposed Tlisitseng Solar 1 PV energy facility could exert a visual impact by further altering the visual character of the		

	surrounding area and exposing sensitive visual receptors to visual impacts. The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the application site via gravel access roads in order to perform maintenance activities on the associated infrastructure and are expected to increase dust emissions in doing so. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Security and operational lighting at the infrastructure associated with the proposed PV energy facility could result in light pollution and glare, which could be an annoyance to surrounding viewers. The visual intrusion of the associated infrastructure could adversely affect farmsteads / homesteads within the visual assessment zone,		

	motorists travelling along the R505 and visitors at Rafters Pub and the Lichtenburg Game Breeding Centre. ▪ The following cumulative visual impacts are expected as a result of the other proposed renewable energy developments and their infrastructure associated during operation: 1) The other proposed renewable energy developments and their associated infrastructure could result in a greater visual impact by altering the visual character of the surrounding area and further exposing more sensitive visual receptor locations to visual impacts. The developments and their associated infrastructure may be perceived as unwelcome visual intrusions, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the other proposed renewable energy developments and their associated infrastructure via gravel access roads and are		

	expected to increase dust emissions in doing so. The increased traffic on the gravel roads and the dust plumes could create a greater visual impact and may evoke more negative sentiments from surrounding viewers. Security and operational lighting at the other proposed renewable energy developments and their associated infrastructure could result in an increase in light pollution and glare, which could be a significant annoyance to surrounding viewers. The visual intrusion of the other proposed renewable energy developments and their associated infrastructure could adversely affect farmsteads / homesteads within certain visual assessment zones, motorists travelling along the R505 and visitors at identified visual receptors.		
Tlisitseng Solar 2 PV Energy Facility	▪ The following visual impacts are expected during the construction of the proposed PV energy facility and associated infrastructure: 2) Large construction vehicles and equipment	▪ The following mitigation measures are recommended: - Carefully plan to reduce the construction period. - Minimise vegetation clearing and rehabilitate	▪ The visual impacts expected during the construction of the proposed PV energy facility and associated infrastructure will be negative low after the implementation of mitigation measures;

	during the construction phase will alter the natural character of the study area and expose visual receptors to visual impacts associated with the construction phase. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. In addition, vehicles and trucks travelling to and from the proposed site on gravel access roads would increase dust emissions. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. The visual intrusion of the construction activities could adversely affect farmsteads / homesteads within the visual assessment zone, motorists travelling along the R505 and visitors at Rafters Pub, the Lichtenburg Game Breeding Centre as well as the Lichtenburg Vakansie Oord. Surface disturbance during construction would also expose bare soil which	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. - Ensure that dust suppression techniques are implemented on gravel access roads, where possible. - Ensure that dust suppression is implemented in all areas where vegetation clearing has taken place. - Ensure that dust suppression techniques are implemented on all soil stockpiles. - Re-vegetate all reinstated cable trenches with the same vegetation that existed prior to the cable being laid. - Temporarily fence-off the construction site (for	▪ The cumulative visual impacts expected as a result of the other proposed renewable energy developments and their associated infrastructure during construction will be negative low after the implementation of mitigation measures; ▪ The visual impacts expected during the operation of the proposed PV energy facility will be medium negative after the implementation of mitigation measures; ▪ The visual impacts expected during the operation of the infrastructure associated with the proposed PV energy facility will be low negative after the implementation of mitigation measures; and ▪ The cumulative visual impacts expected as a result of the other proposed renewable energy developments and their associated infrastructure during

	could visually contrast with the surrounding environment. Additionally, temporarily stockpiling soil during construction may alter the generally flat landscape. Wind blowing over these disturbed areas could therefore result in dust which would have a visual impact. The clearing of vegetation will be required for the installation of the PV panels. This is also expected to result in the generation of dust, alter the natural character of the surrounding area and therefore create a visual impact. ▪ The following cumulative visual impacts are expected as a result of the other proposed renewable energy facilities and their associated infrastructure during construction: 2) The cumulative impacts during the construction phase will only be realised if the construction timelines of one or more of the nearby renewable energy facilities are aligned. Large construction vehicles and equipment during the construction phase of the	the duration of the construction period). - Establish erosion control measures on areas which will be exposed for long periods of time. This is to reduce the potential impact heavy rains may have on the bare soil. - Light fittings for security at the PV energy facility and proposed substation at night should reflect the light toward the ground and prevent light spill. - As far as possible, limit the amount of security and operational lighting present on site. - As far as possible, limit the number of maintenance vehicles which are allowed to access the site. - Ensure that dust suppression techniques are implemented on gravel access roads, where possible. - Only clear vegetation on site and adjacent to the site which is required to be cleared for the correct operation of the facility. - Ensure that the PV arrays are not located within 500m from any of the surrounding	operation will be medium negative after the implementation of mitigation measures.

	other proposed renewable energy developments may further alter the natural character of the study area and expose visual receptors to visual impacts associated with the construction phase. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. In addition, vehicles and trucks travelling to and from the other proposed renewable energy facilities on gravel access roads could increase dust emissions. The increased traffic on the gravel roads and the dust plumes as a result of the other proposed renewable energy developments could create a larger visual impact and may evoke further negative sentiments from surrounding viewers. The visual intrusion of the construction activities associated with the other proposed renewable energy developments could adversely affect farmsteads / homesteads within certain visual assessment zones, motorists travelling along	farmhouses, in order to limit the visual impact of the solar facility on these dwellings. - The O&M buildings should not be illuminated at night. - If overhead power lines are required, align power lines to run parallel to other linear elements and the farm boundaries, where possible. - Bury cables under the ground where possible. - The O&M buildings should be painted with natural tones that fit with the surrounding environment. - Select the alternatives that will have the least impact on visual receptors - Ensure that dust suppression techniques are implemented on gravel access roads, where possible. - Non-reflective surfaces should be utilised where possible. - Ensure that the associated infrastructure are not located within 500m from any of the surrounding farmhouses, in order to	

	the R505 and visitors at identified sensitive visual receptors. Surface disturbance during construction of the other proposed renewable energy developments could also increase the exposure of bare soil which could increase the visual contrast with the surrounding environment. Additionally, temporarily stockpiling soil during construction may alter the generally flat landscape further. Wind blowing over these disturbed areas could therefore result in a greater amount of dust which would have a larger visual impact. The clearing of vegetation will also be required during the construction of the other renewable energy facilities. This is expected to result in an increase in the generation of dust, alter the natural character of the surrounding area further and therefore create a greater visual impact. ▪ The following visual impacts are expected during the operation of the proposed PV energy facility:	limit the visual impact on these dwellings.	

	2) The proposed Tlisitseng Solar 2 PV energy facility could exert a visual impact by altering the visual character of the surrounding area and exposing sensitive visual receptor locations to visual impacts. The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the PV energy facility via gravel access roads and are expected to increase dust emissions in doing so. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Security and operational lighting at the proposed PV energy facility could result in light pollution and glare, which could be an annoyance to surrounding viewers. The visual intrusion of the proposed PV energy facility could adversely affect farmsteads / homesteads within the visual assessment zone, motorists travelling along		

	the R505 and visitors at Rafters Pub, the Lichtenburg Game Breeding Centre as well as the Lichtenburg Vakansie Oord. ▪ The following visual impacts are expected during the operation of the infrastructure associated with the proposed PV energy facility: 2) The infrastructure associated with the proposed Tlisitseng Solar 2 PV energy facility could exert a visual impact by further altering the visual character of the surrounding area and exposing sensitive visual receptors to visual impacts. The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the application site via gravel access roads in order to perform maintenance activities on the associated infrastructure and are expected to increase dust emissions in doing so. The increased traffic on		

	the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Security and operational lighting at the infrastructure associated with the proposed PV energy facility could result in light pollution and glare, which could be an annoyance to surrounding viewers. The visual intrusion of the associated infrastructure could adversely affect farmsteads / homesteads within the visual assessment zone, motorists travelling along the R505 and visitors at Rafters Pub, the Lichtenburg Game Breeding Centre as well as the Lichtenburg Vakansie Oord. ▪ The following cumulative visual impacts are expected as a result of the other proposed renewable energy developments and their infrastructure associated during operation: 1) The other proposed renewable energy developments and their		

	associated infrastructure could result in a greater visual impact by altering the visual character of the surrounding area and further exposing more sensitive visual receptor locations to visual impacts. The developments and their associated infrastructure may be perceived as unwelcome visual intrusions, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the other proposed renewable energy developments and their associated infrastructure via gravel access roads and are expected to increase dust emissions in doing so. The increased traffic on the gravel roads and the dust plumes could create a greater visual impact and may evoke more negative sentiments from surrounding viewers. Security and operational lighting at the other proposed renewable energy developments and their associated infrastructure could result in an increase in light pollution and glare, which could be a significant		

	annoyance to surrounding viewers. The visual intrusion of the other proposed renewable energy developments and their associated infrastructure could adversely affect farmsteads / homesteads within certain visual assessment zones, motorists travelling along the R505 and visitors at identified visual receptors.		
Watershed Solar Energy Facility Phase 1 and Phase 2	It should be noted that the visual impact assessments for the Watershed (Phase I & II) Solar Energy Facility were combined because the main visual receptors within a 2 km radius are located around phase II of the project. Anticipated issues related to the potential visual impact of the proposed Solar PV project include the following: 1) The visibility of the facility to, and potential visual impact on, observers travelling along the R503 and R505 arterial roads and the major local roads traversing near the proposed facility; 2) The visibility of the facility to, and potential visual impact on observers residing at homesteads (farm residences) located	▪ The following mitigation measures are recommended for the visual impact of construction on sensitive visual receptors: - Ensure that vegetation is not unnecessarily cleared or removed during the construction period; - Reduce the construction period through careful logistical planning and productive implementation of resources; - Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. already in disturbed	▪ The visual impact of construction on sensitive visual receptors will be moderate after the implementation of mitigation measures; ▪ The visual impact on users of arterial roads in close proximity to the proposed solar energy facility will be low after the implementation of mitigation measures; ▪ The visual impact on residents of homesteads and settlements in close proximity to the proposed solar energy facility will be moderate after the implementation of mitigation measures;

	within close proximity of the site; 3) Potential cumulative visual impacts (or alternately, consolidation of visual impacts) with specific reference to the existing power line infrastructure traversing the development site; 4) The potential visual impact of the construction of ancillary infrastructure (i.e. the substation at the facility, associated power line and access roads) on observers in close proximity of the facility; 5) The potential visual impact of operational, safety and security lighting of the facility at night on observers residing in close proximity of the facility; 6) The visual absorption capacity of natural or planted vegetation (if applicable); 7) Potential visual impacts associated with the construction phase; and 8) The potential to mitigate visual impacts. It is envisaged that the issues listed above may constitute a significant visual impact at a local and/or regional scale.	areas) wherever possible; - Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads; - Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities; - Reduce and control construction dust through the use of approved dust suppression techniques as and when required, especially on the dirt road giving access to the site (i.e. whenever dust becomes apparent); - Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting; and - Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works.	▪ The visual impact on sensitive visual receptors within the region will be low after the implementation of mitigation measures; and ▪ The visual impact of lighting on sensitive visual receptors will be moderate after the implementation of mitigation measures.

		▪ The following mitigation measures are recommended for the visual impact on users of arterial roads in close proximity to the proposed solar energy facility: **Planning:** - Retain and maintain natural vegetation in all areas outside of the development footprint. **Operations:** - Maintain the general appearance of the facility as a whole. **Decommissioning:** - Remove infrastructure not required for the post-decommissioning use of the facility; - Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications; and - Monitor rehabilitated areas post-decommissioning and implement remedial actions. **Site specific mitigation measures:** - Plant vegetation barriers along the south western (Phase I)	

		borders of the solar energy facility in order to shield the structures from observers travelling along these roads; and - Plant vegetation barriers along the south-eastern (Phase II) borders of the solar energy facility in order to shield the structures from observers travelling along these roads. ▪ The following mitigation measures are recommended for the visual impact on residents of homesteads and settlements in close proximity to the proposed solar energy facility: **<u>Planning:</u>** - Retain and maintain natural vegetation in all areas outside of the development footprint. **Operations:** - Maintain the general appearance of the facility as a whole. **<u>Decommissioning:</u>** - Remove infrastructure not required for the post-	

		decommissioning use of the facility; - Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications; and - Monitor rehabilitated areas post-decommissioning and implement remedial actions. **<u>Site specific mitigation measures:</u>** - Plant vegetation barriers along the western borders of the Phase I PV plant in order to shield the structures from observers residing at the abovementioned homesteads; - Plant vegetation barriers along the eastern borders of the Phase II PV plant in order to shield the structures from observers residing at the abovementioned homesteads; and - Engage with landowners in order to inform, plan and execute mitigation measures. ▪ The following mitigation measures are recommended for the	

		visual impact on sensitive visual receptors within the region: **Planning:** - Retain and maintain natural vegetation in all areas outside of the development footprint. **Operations:** - Maintain the general appearance of the facility as a whole. **Decommissioning:** - Remove infrastructure not required for the post-decommissioning use of the facility; - Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications; and - Monitor rehabilitated areas post-decommissioning and implement remedial actions. **Site specific mitigation measures:** - Plant vegetation barriers (where required) along the borders of the solar energy facility in order to shield the structures from observers residing	

		at the abovementioned homesteads. ▪ The following mitigation measures are recommended for the visual impact of lighting on sensitive visual receptors: **Planning:** - Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself); - Limiting mounting heights of lighting fixtures, or alternatively using foot-light or bollard level lights; - Making use of minimum lumen or wattage in fixtures; - Making use of Low Pressure Sodium lighting or other types of low impact lighting; and - Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.	
Hibernia PV Solar Energy Facility	▪ The following impacts are expected during the construction of the PV array, access roads and associated infrastructure:	▪ The following mitigation measures have been provided for the impacts expected during the construction of the PV array, access roads and	▪ The direct and indirect impacts expected during the construction of the PV array, access roads and associated infrastructure will be

	Direct impacts: 1) Impact of initial site works, construction camp, site set up, setting out, laying services, ground works; 2) Construction of access roads, from junction at local road to site and through site; and 3) Impact of the building construction works to completion. **Indirect impacts:** 1) Hauling and delivery of construction materials regularly on local roads during contract period. **Cumulative impacts:** - None ▪ The following impacts are expected during the operation of the PV array, access roads and associated infrastructure: **Direct impacts:** 1) Effect on people living and working locally, change of local site character from agriculture to industrial; 2) Impact from regular maintenance visits to clean the panels, etc. The operatives would be on site for a period of time to allow the cleaning of the	associated infrastructure: **Direct impacts:** 1) Establish screening structures to shield construction works from sensitive receptors, good traffic and site management and keeping local people informed regarding construction activities; and 2) No working after 6pm. **Indirect impacts:** 1) Protection of existing local trees where needed; and 2) Operate site within construction industry management guidelines. **Cumulative impacts:** - None ▪ The following mitigation measures have been provided for the impacts expected during the operation of the PV array, access roads and associated infrastructure: **Direct impacts:**	medium after the implementation of mitigation measures; ▪ The direct and indirect impacts expected during the operation of the PV array, access roads and associated infrastructure will be medium after the implementation of mitigation measures; and ▪ The cumulative impacts expected during the operation of the PV array, access roads and associated infrastructure will be medium after the implementation of mitigation measures.

	panels with a water based solution and to undertake infrastructure repairs if required. The visual impact would likely be minimal; and 3) Impact of the colours, finishes and heights of the buildings. **Indirect impacts:** - None **Cumulative impacts:** 1) Based on the present information the cumulative impacts are associated with the substation and power lines in the area.	1) Protection afforded to shielding objects such as the trees. **Indirect impacts:** - None **Cumulative impacts:** - None	

A literature review of other visual specialist studies, which were conducted for the other renewable energy developments being proposed and/or constructed in the area, was undertaken as part of this VIA. This was done in order to clearly define the identified cumulative impacts, and to indicate how the appropriate recommendations, mitigation measures and conclusions of the other visual impact assessment reports have been taken into consideration when drafting this visual impact assessment report.

In terms of the review undertaken on the above reports, it can be noted that the findings of the other specialist studies identified similar impacts for each of the renewable energy developments mentioned above. These include the visual impacts on users of arterial and secondary roads, the visual impacts on residents of homesteads and settlements, the visual impacts on sensitive visual receptors, the visual impacts of lighting at night on sensitive visual receptors, the visual impacts of construction on sensitive visual receptors and the visual impacts on the visual quality of the landscape and sense of place. As such, this VIA is deemed to have adequately defined, identified and assessed the cumulative visual impacts which could arise as a result of the development of the renewable energy facilities.

The visual impact assessment undertaken for the proposed Tlisitseng 1 substation and 132kV power line development has provided mitigation measures which are in-line with the applicable and relevant recommendations noted in the other specialist studies consulted above. As such, the

mitigation measures provided in this visual impact assessment are considered to be sufficient to reduce the visual impacts experienced within the study area. Should all of the recommended mitigation measures be implemented, it is anticipated that the visual impacts associated with the renewable energy developments could be mitigated to acceptable levels. This will also reduce the significance of the identified visual impacts and will aid in reducing the cumulative impacts experienced as a result of the other renewable energy developments and their associated electrical infrastructure being proposed and/or constructed within the surrounding area. This was evident during the review of the other specialist studies as the significance rating for most of the identified impacts were deemed to be of medium to low significance after the implementation of mitigation measures. Additionally, with the correct mitigation and integrating planning, the significance rating of majority of the cumulative impacts will be relatively low.

It should also be noted that the Watershed MTS and the associated electrical infrastructure can be found within close proximity to the proposed on-site substation and power line development. As such, the proposed on-site substation and power line development is considered to conform with the current developments present within the study area and will not significantly alter the visual character of the surrounding area.

The visual specialists provided certain site-specific recommendations / mitigation measures which are aimed at reducing the visual impact associated with the proposed solar PV developments. These above-mentioned site specific mitigation measures will however not apply to the proposed 132kV power line and substation as the nature of the impact is different. As mentioned above, the 132kV power line and substation would be built to serve the needs of the power generated from the solar PV energy facility, they would only be constructed if the solar PV energy facility was also developed. Views of the substation and power line would therefore be dwarfed by the large number of PV arrays that would be visible. As such, the substation and power line are not expected to be associated with a significant visual impact, or even a measurable cumulative impact on their own. The cumulative impact experienced in the area would therefore largely related to the impact of the surrounding renewable energy facilities.

This VIA is deemed to have clearly defined the identified cumulative impacts. It should however be noted that it is not possible to quantify or provide the spatial extent of the anticipated visual impacts as these impacts would not be site-specific and would be significantly influenced by a number of factors such as the presence of sensitive visual receptors, the amount of screening present, the orientation of the sensitive visual receptors and the visual character of the study area.

4.6 Overall Visual Impact Rating

The BA requires that an overall rating for visual impact be provided to allow the visual impact to be assessed alongside other environmental parameters. SiVEST has developed an impact rating

matrix for this purpose. The tables below present the impact matrix for visual impacts associated with the proposed construction and operation of the 132kV on-site Tlisitseng 1 Substation, 132kV power line and the associated infrastructure.

Please refer to **Appendix A** below for an explanation of the impact rating methodology.

4.6.1 Planning

No visual impacts are expected during planning.

4.6.2 Construction

Table 9: Rating of visual impacts of the proposed on-site Tlisitseng 1 Substation and 132kV power line (including associated infrastructure) during construction

IMPACT TABLE	
Environmental Parameter	Visual Impact
Issue/Impact/Environmental Effect/Nature	Large construction vehicles and equipment during the construction phase will alter the natural character of the study area and expose visual receptors to visual impacts associated with the construction phase. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. A network of gravel access roads will be required in order to provide access to the proposed power line. Considering the flat nature of the terrain on the site, it is likely that the visual impact associated with these roads would be limited to the impact of clearing the vegetation. However, if these roads are not maintained correctly during the construction phase, maintenance vehicles travelling along the gravel access roads could increase dust emissions and expose surrounding farmstead to dust plumes. In addition, vehicles and trucks travelling to and from the proposed Substation site on gravel access roads would increase dust emissions. The increased traffic on the gravel roads and the dust plumes could therefore also create a visual impact and may evoke negative sentiments from surrounding viewers. The visual intrusion of the construction activities associated with

	the proposed substation and power line could adversely affect farmsteads / homesteads within the visual assessment zone, motorists travelling along the R505 and visitors at the Lichtenburg Game Breeding Centre, Lichtenburg Vakansie Oord and Rafters Pub. Surface disturbance during construction would also expose bare soil which could visually contrast with the surrounding environment. Additionally, temporarily stockpiling soil during construction may alter the generally flat landscape. Wind blowing over these disturbed areas could therefore result in dust which would have a visual impact. The clearing of vegetation will also be required for the installation of the proposed Tlisitseng 1 Substation. This is expected to result in the generation of dust, alter the natural character of the surrounding area and therefore create a visual impact.	
Extent	Local / District (2)	
Probability	Probable (3)	
Reversibility	Completely reversible (1)	
Irreplaceable loss of resources	Marginal loss (2)	
Duration	Short term (1)	
Cumulative effect	Medium cumulative effects (3)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Low negative impact **After mitigation measures:** Low negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	2
Reversibility	1	1
Irreplaceable loss	2	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	-24 (negative low)	-20 (negative low)

Mitigation measures	▪ Plan carefully to reduce the construction period. ▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible, in accordance with the recommendations of the biodiversity specialist. ▪ Vegetation clearing should take place in a phased manner. ▪ Make use of nurseries to speed up recovery of vegetation. ▪ 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. ▪ Ensure that dust suppression techniques are implemented on gravel access roads, where possible. ▪ Ensure that dust suppression is implemented in all areas where vegetation clearing has taken place. ▪ Ensure that dust suppression techniques are implemented on all soil stockpiles. ▪ Re-vegetate all reinstated cable trenches with the same vegetation that existed prior to the cable being laid. ▪ Select the substation alternative that will have the least impact on visual receptors (i.e. Substation Alternative 1). ▪ Establish erosion control measures on areas which will be exposed for long periods of time. This is to reduce the potential impact heavy rains may have on the bare soil. ▪ Where possible, laydown areas and temporary construction equipment and camps should be placed in already in disturbed areas in order to minimise vegetation clearing. ▪ Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.

	▪ Where possible, protect existing local trees and maintain natural vegetation outside the development footprint.

** Please note in the context of the visual environment 'resources' are defined as scenic / natural views that are almost impossible to replace.*

Table 10: Rating of cumulative visual impacts as a result of the other proposed renewable energy developments (including associated infrastructure) during construction

IMPACT TABLE	
Environmental Parameter	Cumulative Visual Impact
Issue/Impact/Environmental Effect/Nature	The cumulative impacts during the construction phase will only be realised if the construction timelines of one or more of the nearby renewable energy developments are aligned. Large construction vehicles and equipment during the construction phase of the other proposed renewable energy developments may further alter the natural character of the study area and expose visual receptors to visual impacts associated with the construction phase. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. In addition, vehicles and trucks travelling to and from the other proposed renewable energy developments on gravel access roads could increase dust emissions. The increased traffic on the gravel roads and the dust plumes as a result of the other proposed renewable energy developments could create a larger visual impact and may evoke further negative sentiments from surrounding viewers. The visual intrusion of the construction activities associated with the other proposed renewable energy developments could adversely affect farmsteads / homesteads within certain visual assessment zones, motorists travelling along the R505 and visitors at identified sensitive visual receptors. Surface disturbance during construction of the other proposed renewable energy developments could also increase the exposure of bare soil which could increase the visual contrast with the surrounding environment. Additionally, temporarily stockpiling soil during construction may alter the generally flat landscape further. Wind blowing over these disturbed areas could therefore result in a greater amount of dust

	which would have a larger visual impact. The clearing of vegetation will also be required during the construction of the other renewable energy developments. This is expected to result in an increase in the generation of dust, alter the natural character of the surrounding area further and therefore create a greater visual impact.	
Extent	Local / District (2)	
Probability	Possible (2)	
Reversibility	Partly reversible (2)	
Irreplaceable loss of resources	Marginal loss (2)	
Duration	Medium term (2)	
Cumulative effect	Medium cumulative effects (3)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Low negative impact **After mitigation measures:** Low negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	2	2
Reversibility	2	1
Irreplaceable loss	2	2
Duration	2	2
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	-26 (low negative)	-24 (negative low)
Mitigation measures	▪ Plan carefully to reduce the construction period. ▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible, in accordance with the recommendations of the biodiversity specialist. ▪ Vegetation clearing should take place in a phased manner. ▪ Make use of nurseries to speed up recovery of vegetation. ▪ 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. ▪ Ensure that dust suppression techniques are implemented on gravel access roads, where possible. ▪ Ensure that dust suppression is implemented in all areas where vegetation clearing has taken place. ▪ Ensure that dust suppression techniques are implemented on all soil stockpiles. ▪ Re-vegetate all reinstated cable trenches with the same vegetation that existed prior to the cable being laid. ▪ Establish erosion control measures on areas which will be exposed for long periods of time. This is to reduce the potential impact heavy rains may have on the bare soil. ▪ Where possible, laydown areas and temporary construction equipment and camps should be placed in already in disturbed areas in order to minimise vegetation clearing. ▪ Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting. ▪ Where possible, protect existing local trees and maintain natural vegetation outside the development footprint.

4.6.3 Operation

Table 11: Rating of visual impacts of the proposed on-site Tlisitseng 1 Substation and 132kV power line (including associated infrastructure) during operation

IMPACT TABLE	
Environmental Parameter	Visual Impact
Issue/Impact/Environmental Effect/Nature	The proposed Tlisitseng 1 Substation and 132kV power line could exert a visual impact by altering the visual character of the surrounding area and exposing sensitive visual receptor locations to visual impacts. The development may

	be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. This is especially true for the power line towers, which are tall structures and will most likely be visible for greater distances. However, where existing power lines are present the visual environment would already be visually 'degraded' and thus the introduction of a new power line in this setting may be considered to be less of a visual impact than if no existing built infrastructure were visible. A network of gravel access roads will be required in order to provide access to the proposed power line. Considering the flat nature of the terrain on the site, it is likely that the visual impact associated with these roads would be limited to the impact of clearing the vegetation. However, if these roads are not maintained correctly, maintenance vehicles travelling along the gravel access roads could increase dust emissions and expose surrounding farmstead to dust plumes. In addition, maintenance vehicles may also need to access the proposed on-site Tlisitseng 1 Substation via gravel access roads and are also expected to increase dust emissions in doing so. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Security and operational lighting at the proposed Tlisitseng 1 Substation could result in light pollution and glare, which could be an annoyance to surrounding viewers. The visual intrusion of the proposed Tlisitseng 1 Substation and 132kV power line could also adversely affect farmsteads / homesteads within the visual assessment zone, motorists travelling along the R505 and visitors at the Lichtenburg Game Breeding Centre, Lichtenburg Vakansie Oord and Rafters Pub.
Extent	Local/district (2)
Probability	Definite (4)
Reversibility	Barely reversible (3)
Irreplaceable loss of resources	Marginal (2)
Duration	Long term (3)
Cumulative effect	Medium cumulative effects (3)

Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Medium negative impact **After mitigation measures:** Medium negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	4	4
Reversibility	3	3
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	-34 (medium negative)	-34 (medium negative)
Mitigation measures	▪ Light fittings for security at night should reflect the light toward the ground and prevent light spill. ▪ As far as possible, limit the amount of security and operational lighting present at the on-site substation. ▪ If possible, the O&M buildings should not be illuminated at night. Alternatively, light sources should be shielded by physical barriers (walls, vegetation, or the structure itself). ▪ If possible, light sources should be shielded by physical barriers (walls, vegetation, or the structure itself); ▪ Make use of minimum lumen or wattage in fixtures; ▪ Limiting mounting heights of lighting fixtures, or alternatively using foot-light or bollard level lights; ▪ If possible, make use of motion detectors on security lighting. ▪ As far as possible, limit the number of maintenance vehicles which are allowed to access the substation site and power line access roads. ▪ Ensure that dust suppression techniques are implemented on gravel access roads, where possible. ▪ Only clear vegetation which is required to be cleared for the correct operation of the development.	

	▪ Ensure that the associated infrastructure are not located within 500m from any of the surrounding farmhouses, in order to limit the visual impact of the development on these dwellings. ▪ Align the power line within the authorised corridor as far away from Rafters Pub as possible i.e. in the northern and eastern parts of the corridor. ▪ Non-reflective surfaces should be utilised where possible. ▪ If overhead power lines are required, align power lines to run parallel to other linear elements and the farm boundaries, where possible. ▪ Bury cables under the ground where possible. ▪ The O&M buildings should be painted with natural tones that fit with the surrounding environment. ▪ Select the alternatives that will have the least impact on visual receptors (i.e. Substation Alternative 1).

** Please note in the context of the visual environment 'resources' are defined as scenic / natural views that are almost impossible to replace.*

Table 12: Rating of cumulative visual impacts as a result of the other proposed renewable energy developments (including associated infrastructure) during operation

IMPACT TABLE	
Environmental Parameter	Cumulative Visual Impact
Issue/Impact/Environmental Effect/Nature	The other proposed renewable energy developments and their associated infrastructure could result in a greater visual impact by altering the visual character of the surrounding area and further exposing more sensitive visual receptor locations to visual impacts. The developments and their associated infrastructure may be perceived as unwelcome visual intrusions, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the other proposed renewable energy developments and their associated infrastructure via gravel access roads and are expected to increase dust emissions in doing so. The increased traffic on the gravel roads and the dust plumes could create a greater visual impact and may evoke more negative sentiments from surrounding viewers. Security and operational lighting at the other

	proposed renewable energy developments and their associated infrastructure could result in an increase in light pollution and glare, which could be a significant annoyance to surrounding viewers. The visual intrusion of the other proposed renewable energy developments and their associated infrastructure could adversely affect farmsteads / homesteads within certain visual assessment zones, motorists travelling along the R505 and visitors at identified visual receptors.	
Extent	Local / District (2)	
Probability	Probable (3)	
Reversibility	Irreversible (4)	
Irreplaceable loss of resources	Significant loss of resources (3)	
Duration	Long term (3)	
Cumulative effect	Medium cumulative impact (3)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Medium negative impact **After mitigation measures:** Medium negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	3
Reversibility	4	4
Irreplaceable loss	3	2
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	-36 (medium negative)	-34 (medium negative)
Mitigation measures	▪ Light fittings for security at night should reflect the light toward the ground and prevent light spill. ▪ As far as possible, limit the amount of security and operational lighting present on the site. ▪ If possible, light sources should be shielded by physical barriers (walls, vegetation, or the structure itself); ▪ Make use of minimum lumen or wattage in fixtures;	

	▪ Limiting mounting heights of lighting fixtures, or alternatively using foot-light or bollard level lights; ▪ If possible, make use of motion detectors on security lighting. ▪ As far as possible, limit the number of maintenance vehicles which are allowed to access the sites. ▪ Ensure that dust suppression techniques are implemented on gravel access roads, where possible. ▪ Only clear vegetation on the sites and adjacent to the sites which is required to be cleared for the correct operation of the facilities. ▪ Ensure that the on-site substation is not located within 500m from any of the surrounding farmhouses, in order to limit the visual impact of the development on these dwellings. ▪ Light fittings for security at the proposed substations at night should reflect the light toward the ground and prevent light spill. ▪ Align power lines to run parallel to other linear elements and the farm boundaries, where possible. ▪ Bury cables under the ground where possible. ▪ Select the alternatives that will have the least impact on visual receptors (i.e. Substation Alternative 1). ▪ Limit the number of maintenance vehicles which are allowed to access the sites. ▪ Ensure that dust suppression techniques are implemented on gravel access roads, where possible. ▪ Non-reflective surfaces should be utilised where possible.

4.6.4 Decommissioning

Visual impacts during the decommissioning phase are potentially similar to those during the construction phase. It is however recommended that the following mitigation be implemented during decommissioning:

- All infrastructure that is not required for the post-decommissioning use should be removed;
- Rehabilitate all cleared areas as soon as possible, in accordance with the recommendations of the biodiversity specialist; and
- Monitor rehabilitated areas post-decommissioning and implement remedial actions, as required.

5 COMPARATIVE ASSESSMENT OF ALTERNATIVES

As previously mentioned, only two (2) on-site substation site alternatives are being investigated at this stage.

The preference rating for each alternative is provided in **Table 13** below. The alternatives are rated as being either preferred (the alternative will result in a low visual impact / reduce the visual impact), not-preferred (the alternative will result in relatively high visual impact / increase the visual impact), favourable (the visual impact will be relatively insignificant) and no-preference (each alternative would result in an equal visual impact).

The degree of visual impact and rating has been determined based on the following factors:

- The location of the on-site substation site in relation to areas of high elevation, especially ridges, koppies or hills;
- The location of the on-site switching substation site in relation to sensitive receptor locations; and
- The location of the on-site substation site in relation to areas of natural bushveld vegetation (clearing site for the development worsens the visibility).

Key

PREFERRED	The alternative will result in a low impact / reduce the impact
FAVOURABLE	The impact will be relatively insignificant
NOT PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Table 13: Comparative Assessment of Alternatives

Alternative	Preference	Reasons
SUBSTATION		
Alternative 1	Preferred	The proposed substation site alternative is situated in a largely natural area and no other existing

Alternative	Preference	Reasons
		electrical infrastructure and significant anthropogenic features are located within close proximity. The Watershed MTS can be found approximately 2.4km to the south-east of the proposed substation site alternative. No sensitive or potentially sensitive visual receptors can be found within 500m of this alternative. Twelve (12) potentially sensitive receptor locations can be found within 2km of the proposed substation site alternative, within the moderate impact zone. In addition, one (1) sensitive visual receptor, namely VR 14 – Rafters Pub, can be found within 2km of this alternative. It must be noted that one (1) sensitive visual receptor, namely VR 64 – Lichtenburg Game Breeding Centre, can be found further than 2km from the substation site alternative, within the low impact zone, while one (1) sensitive visual receptor, namely VR 62 – Lichtenburg Vakansie Oord, can be found further than 5km from the alternative and is considered to be negligible from a visual perspective. As such, Substation Site Alternative 1 is considered to be the preferred option as it would impact on slightly fewer potentially sensitive receptor locations. In addition, the substation would only be constructed if the proposed Tlisitseng solar 1 PV energy facility was developed as well. The impact of the substation would therefore be dwarfed by the large number of PV panels that would be visible.

Alternative	Preference	Reasons
Alternative 2	Favourable	The proposed substation site alternative is situated in a largely natural area and no other existing electrical infrastructure and significant anthropogenic features are located within close proximity. The Watershed MTS can be found approximately 2.4km to the south-east of Substation Site Alternative 2. No sensitive or potentially sensitive visual receptors can be found within 500m of this alternative. Thirteen (13) potentially sensitive receptor locations can be found within 2km of the proposed substation site alternative, within the moderate impact zone. In addition, one (1) sensitive visual receptor, namely VR 14 – Rafterrs Pub, can be found within 2km of Substation Site Alternative 2. It must be noted that one (1) sensitive visual receptor, namely VR 64 – Lichtenburg Game Breeding Centre, can be found further than 2km from the substation site alternative, within the low impact zone, while one (1) sensitive visual receptor, namely VR 62 – Lichtenburg Vakansie Oord, can be found further than 5km from the alternative and is considered to be negligible from a visual perspective. Although Substation Site Alternative 2 is located slightly closer to only one (1) of the potentially sensitive visual receptors it is still considered to be a favourable option as it would impact on fewer potentially sensitive receptor locations. In addition, the substation would only be constructed if the proposed Tlisitseng solar 1 PV energy facility was developed as well. The

Alternative	Preference	Reasons
		impact of the substation would therefore be dwarfed by the large number of PV panels that would be visible.

6 CONCLUSIONS

The Visual Impact Assessment (VIA) conducted for the proposed on-site Tlisitseng 1 Substation, 132kV power line and associated infrastructure has demonstrated that much of the study area has a natural visual character, with certain areas displaying a distinctly rural or pastoral component where maize cultivation and farmsteads occur. In addition, the study area is generally not valued for its tourism significance and is rated as having a low visual sensitivity. It should however be noted that the larger area might be valued for its tourism significance as the rich history of the area and the presence of several tourist attractions could attract tourists into the area. It was ascertained that due to the dominant farming practices and the relatively limited human habitation in the surrounding area, only three (3) sensitive receptors are present in the study area, namely the Lichtenburg Vakansie Oord (VR 62), the Lichtenburg Game Breeding Centre (VR 64) and Rafters Pub (VR 14). These three (3) visually sensitive receptors are regarded as facilities with current and future tourism potential and are therefore expected to experience the most significant visual impacts as a result of the proposed development. It should however be noted that at this stage, the game breeding centre is not operational. However, it is estimated that the restoration and construction process of the game breeding centre will last another year and it may be operated as a tourism facility in the future. Despite the tourism significance of the three (3) sensitive visual receptor locations, the proposed development is expected to have a low visual impact on the Lichtenburg Vakansie Oord while it will have a moderate visual impact on the Lichtenburg Game Breeding Centre and Rafters Pub. It must also be noted that the R505 main road, which traverses the power line corridor as well as the study area, is considered to be a visually sensitive road and the relatively high volumes of motorists travelling along this road would be visually exposed to the proposed development. Several scattered farmsteads / homesteads which are used to house the local farmers as well as their farm workers were also identified within the study area and are regarded as potentially sensitive visual receptors. Upon further investigation, it was established that the proposed development would have a low visual impact on majority of the potentially visual receptors. The proposed development was not deemed to have a high visual impact on any of the receptor locations identified within the study area.

The overall significance of the visual impacts as a result of the proposed development during construction and operation was assessed according to SiVEST's impact rating matrix. The assessment revealed that overall the proposed on-site Tlisitseng 1 Substation and 132kV power

line would have a low visual impact during construction and a medium visual impact during operation, with a number of mitigation measures available.

As part of the VIA, the proposed on-site substation site alternatives were also comparatively assessed. The comparative assessment of alternatives revealed that the proposed On-site Substation Site Alternative 1 would be the preferred option, while On-site Substation Site Alternative 2 was deemed to be a favourable option from a visual perspective.

A literature review of other visual specialist studies, which were conducted for the other renewable energy developments being proposed and/or constructed in the area, was undertaken as part of this VIA. This was done in order to clearly define the identified cumulative impacts, and to indicate how the appropriate recommendations, mitigation measures and conclusions of the other visual impact assessment reports have been taken into consideration when drafting this visual impact assessment report. The VIA is deemed to have clearly defined the identified cumulative impacts that would be experienced in the surrounding area.

Overall it can be concluded that the visual impact of the proposed on-site Tlisitseng 1 Substation and 132kV power line would be reduced due to the presence of existing electrical infrastructure and linear elements in the study area, as well as the lack of sensitive visual receptors present. In addition, the on-site substation and power line are being proposed in order to supply the electricity generated by the two (2) proposed Tlisitseng PV energy facilities to Eskom's national grid. Thus the substation and power line would only be constructed if the proposed Tlisitseng PV energy facilities are developed as well. The substation and power line would likely form part of the PV complex, as viewed from the surrounding farmsteads and the impact would therefore be dwarfed by the large number of PV panels that would be visible.

6.1 Environmental Impact Statement

It is SiVEST's opinion that the visual impacts are not significant enough to prevent the project from proceeding and that an Environmental Authorisation (EA) should be granted. From a visual impact perspective only three (3) sensitive visual receptors have been identified within the study area. In addition, the existing electrical infrastructure and other linear elements already present within the study area have already altered the natural character of the surrounding environment to a degree and are expected to lower the visual sensitivity of the area. The visual impacts associated with the proposed development is expected to have a low visual impact on most of the sensitive and potentially sensitive visual receptors identified within the study area. It must also be noted that SiVEST believe that the impacts associated with the construction and operation phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

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I, **Stephan Jacobs**, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of visual assessment services. There are no circumstances that compromise the objectivity of my performing such work.

Stephan Jacobs
Environmental Consultant
SiVEST Environmental Division

I, **Andrea Gibb**, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of visual assessment services. There are no circumstances that compromise the objectivity of my performing such work.

Andrea Gibb
Environmental Consultant
SiVEST Environmental Division

Appendix A

IMPACT RATING METHODOLOGY

IMPACT RATING METHODOLOGY

The determination of the effect of an environmental impact on an environmental parameter (in this instance, wetlands) is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global) whereas intensity is defined by the severity of the impact (e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence). Significance is calculated as per the example shown in **Table 1**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Impact Rating System Methodology

Impact assessments must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is usually assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

In this case, a unique situation is present whereby various scenarios have been posed and evaluated accordingly. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

Table 1: Example of the significance impact rating table.

NATURE		
Includes a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.

3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		

1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects

INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	**Impact Significance Rating**	**Description**
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

Appendix B

LIST OF VISUALLY SENSITIVE AND POTENTIALLY SENSITIVE RECEPTOR LOCATIONS

Table i: Visually sensitive / potentially sensitive receptor locations within the study area

Name	Type	Coordinates	Zone of visual exposure
VR 1	Houthaalboomen Farmhouse	26° 4'12.82"S 26° 7'30.12"E	Moderate
VR 2	Houthaalboomen Farmhouse	26° 4'9.67"S 26° 7'48.32"E	Moderate
VR 3	Houthaalboomen Farmhouse	26° 3'37.12"S 26° 7'34.57"E	Low
VR 4	Houthaalboomen Farmhouse	26° 3'32.67"S 26° 7'12.12"E	Low
VR 5	Houthaalboomen Farmhouse	26° 3'31.90"S 26° 6'49.78"E	Low
VR 7	Houthaaldoorns Farmhouse (Sensako)	26° 3'2.28"S 26° 5'14.55"E	Low
VR 8	Houthaaldoorns Farmhouse (Sensako)	26° 3'3.96"S 26° 5'11.37"E	Low
VR 9	Houthaaldoorns Farmhouse (Sensako)	26° 3'6.79"S 26° 5'4.42"E	Low
VR 10	Houthaaldoorns Farmhouse (Sensako)	26° 3'6.37"S 26° 5'13.13"E	Low
VR 11	Houthaalboomen Farmhouse	26° 4'50.57"S 26° 5'15.03"E	Low
VR 12	Houthaalboomen Farmhouse	26° 5'13.10"S 26° 5'57.13"E	Moderate
VR 13	Houthaalboomen Farmhouse	26° 5'53.32"S 26° 5'56.97"E	Moderate
VR 14	Talene Farmhouse and Rafters Pub	26° 5'42.74"S 26° 6'44.71"E	High
VR 15	Houthaalboomen Farmhouse	26° 6'15.12"S 26° 6'53.49"E	Moderate
VR 16	Elandsfontein Farmhouse	26° 6'26.07"S 26° 6'45.92"E	Moderate
VR 17	Talene Farmhouse	26° 5'45.27"S 26° 7'10.49"E	High
VR 18	Houthaalboomen Farmhouse	26° 6'5.41"S 26° 7'14.36"E	Moderate
VR 19	Houthaalboomen Farmhouse	26° 6'7.51"S 26° 7'35.37"E	Moderate
VR 20	Elandsfontein Farmhouse	26° 6'13.00"S 26° 7'41.02"E	Moderate

Name	Type	Coordinates	Zone of visual exposure
VR 21	Houthaalboomen Farmhouse	26° 6'2.84"S 26° 7'48.74"E	Moderate
VR 22	Talene Farmhouse	26° 5'40.57"S 26° 7'32.71"E	High
VR 23	Talene Farmhouse	26° 5'30.63"S 26° 7'56.63"E	High
VR 24	Priem Farmhouse	26° 5'42.17"S 26° 7'58.07"E	Moderate
VR 25	Priem Farmhouse	26° 5'52.54"S 26° 8'5.17"E	Moderate
VR 26	Priem Farmhouse	26° 5'47.07"S 26° 8'23.48"E	High
VR 27	Elandsfontein Farmhouse	26° 5'58.23"S 26° 8'21.92"E	Moderate
VR 28	Elandsfontein Farmhouse	26° 5'59.46"S 26° 8'15.53"E	Moderate
VR 29	Elandsfontein Farmhouse	26° 6'12.00"S 26° 8'32.09"E	Moderate
VR 30	Elandsfontein Farmhouse	26° 6'17.60"S 26° 8'22.83"E	Moderate
VR 31	Elandsfontein Farmhouse	26° 7'2.71"S 26° 8'19.94"E	Low
VR 32	Elandsfontein Farmhouse (Boskoppie)	26° 6'24.04"S 26° 8'22.83"E	Moderate
VR 33	Elandsfontein Farmhouse	26° 6'36.89"S 26° 8'24.30"E	Moderate
VR 34	Lichtenburg Drive-in Theatre	26° 6'38.28"S 26° 8'45.61"E	Moderate
VR 35	Elandsfontein Farmhouse	26° 6'53.21"S 26° 8'19.33"E	Low
VR 36	Elandsfontein Farmhouse	26° 7'11.22"S 26° 8'17.02"E	Low
VR 37	Elandsfontein Farmhouse	26° 7'32.70"S 26° 8'19.87"E	Low
VR 38	Elandsfontein Farmhouse	26° 7'33.72"S 26° 8'36.66"E	Low
VR 39	Elandsfontein Farmhouse	26° 7'31.97"S 26° 8'47.57"E	Low
VR 40	Elandsfontein Farmhouse	26° 7'43.44"S	Low

Name	Type	Coordinates	Zone of visual exposure
		26° 8'55.14"E	
VR 41	Elandsfontein Farmhouse	26° 7'49.21"S 26° 8'55.71"E	Low
VR 42	Elandsfontein Farmhouse (Elandsfontein)	26° 7'48.81"S 26° 8'40.81"E	Low
VR 43	Elandsfontein Farmhouse	26° 7'41.96"S 26° 8'40.52"E	Low
VR 44	Elandsfontein Farmhouse	26° 7'42.01"S 26° 8'7.67"E	Low
VR 45	Elandsfontein Farmhouse	26° 7'45.34"S 26° 8'3.46"E	Low
VR 46	Elandsfontein Farmhouse	26° 7'46.47"S 26° 8'6.12"E	Low
VR 47	Elandsfontein Farmhouse	26° 7'54.67"S 26° 7'47.65"E	Low
VR 48	Elandsfontein Farmhouse	26° 7'50.58"S 26° 7'33.20"E	Low
VR 49	Elandsfontein Farmhouse	26° 7'53.23"S 26° 7'11.21"E	Low
VR 51	Elandsfontein Farmhouse	26° 8'10.44"S 26° 8'38.10"E	Low
VR 52	Elandsfontein Farmhouse	26° 8'10.29"S 26° 8'45.99"E	Low
VR 53	Elandsfontein Farmhouse	26° 8'5.95"S 26° 8'47.70"E	Low
VR 54	Elandsfontein Farmhouse	26° 8'7.24"S 26° 8'50.98"E	Low
VR 55	Elandsfontein Farmhouse	26° 8'9.14"S 26° 8'52.41"E	Low
VR 56	Elandsfontein Farmhouse	26° 8'10.95"S 26° 8'55.66"E	Low
VR 57	Elandsfontein Farmhouse	26° 8’12.30”S 26° 9’0.90”E	Low
VR 58	Lichtenburg Town and Townlands Farmhouse	26° 7'45.88"S 26° 9'26.55"E	Low
VR 62	Lichtenburg Vakansie Oord (Vacation Resort)	26° 7'23.23"S 26° 9'57.12"E	Low
VR 63	Pub near the entrances of the Lichtenburg Game Breeding Centre and Lichtenburg Vakansie Oord	26° 7'49.84"S 26°10'6.46"E	Low

Name	Type	Coordinates	Zone of visual exposure
VR 64	Lichtenburg Game Breeding Centre (Tourism Facility)	26° 4'52.19"S 26° 9'33.45"E	Moderate

Appendix C

SPECIALIST CVS

CURRICULUM VITAE

Stephan Hendrik Jacobs

Name	Stephan Hendrik Jacobs
Profession	Environmentalist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Graduate Environmental Consultant
Years with Firm	Joined May 2015
Date of Birth	28 May 1991
ID Number	9105285065080
Nationality	South African

Education

Pretoria Boys High, Pretoria, South Africa, Matriculated 2009.

Professional Qualification

- BSc Hons Environmental Management and Analysis, (Post Graduate) University Of Pretoria Honours (2014).
- BSc Environmental Sciences (Undergraduate) University Of Pretoria (2012-2013)

Employment Record

May 2015 – current	SiVEST SA (Pty) Ltd – Graduate Environmental Consultant
Nov 2014 – Feb 2015	Sodwana Bay Fishing Charters – Assistant Manager
Oct 2014 – Mar 2015	Ufudu Turtle Tours – Tour Guide

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Excellent	Excellent	Excellent
Afrikaans	Good	Good	Good

Key Experience

Stephan joined SiVEST in May 2015 and holds the position of Graduate Environmental Consultant in the Johannesburg office.

Stephan specialises in the field of Environmental Management and has been involved in the compilation of Environmental Impact Assessments (EIAs) and Basic Assessments (BAs). Stephan has also assisted extensively in the undertaking of field work and the compilation of reports for specialist studies such as surface water and visual impact assessments. Stephan also has experience in Environmental Compliance and Auditing and has acted as an Environmental Control Officer (ECO) for several infrastructure projects.

Stephan has been educated and achieved his degrees (BSc and BSc Hons) at the University of Pretoria in Environmental Sciences (Environmental Management & Analysis).

Throughout his time at SiVEST, Stephan has acquired the following skills:

- Strong computer skills (Work, excel, powerpoint etc);
- Strong Proposal and report writing skills;
- Report compilation skills for Environmental Impact Assessments (EIAs) and Basic Assessments (BAs);

- Report compilation skills for Environmental Management Plans/Programmes (EMPr);
- Compilation and conducting Visual Impact Assessments;
- Assisting in Surface Water / Wetland Delineations and Assessments.

Key experience includes:

- Environmental Impact Assessment (EIA) of small, medium and large-scale infrastructure projects,
- Basic Assessment (BA), of small, medium and large-scale infrastructure projects,
- Environmental Management Plans (EMPr), of small, medium and large-scale infrastructure projects,
- Proposal and tender compilation,
- Environmental Compliance and Auditing (ECO);
- Various site inspections, and
- Visual Impact Assessments (Field work and report compilation).

Projects Experience

Stephan is responsible for the following activities: report writing, proposal writing, assisting in specialist surface water delineation and functional assessments, assisting in visual impact assessments and environmental compliance and auditing procedures. Current and completed projects / activities are outlined in detail below:

- Environmental Control Officer (ECO) for the Polokwane Integrated Rapid Public Transport System (IRPTS), Limpopo Province.

- Basic Assessment (BA) for the construction of a Non-Motorised Transport (NMT) Training and Recreational Park adjacent to the Peter Mokaba Stadium in Polokwane, Limpopo Province.

- Basic Assessment (BA) for the Proposed Expansion of the Tissue Manufacturing Capacity at the Twinsaver Kliprivier Operations Base, Gauteng Province.

- Environmental Control Officer (ECO) for Phase 1 and Phase 2 of the Newmarket Retail Development, Gauteng Province.

- Environmental Review of the Xakwa Coal Operations, adjacent to the proposed Eastside Junction Development.

- Environmental Due Diligence for the Woodlands and Harrowdene Office Parks in Woodmead, Gauteng Province.

- Visual Impact Assessment for the Helena Solar PV Plant, Northern Cape Province.

- Visual Impact Assessment for the Nsoko Msele Integrated Sugar Project, Swaziland.

- Visual Impact Assessments for the proposed construction of the Sendawo Solar 1, Sendawo Solar 2 and Sendawo Solar 3 Photovoltaic (PV) Energy Facilities near Vryburg, North West Province.

- Visual Impact Assessments for the proposed construction of the Sendawo Substation and Associated 400kV Power Line near Vryburg, North West Province.

- Visual Impact Assessments for the proposed construction of the Tlisitseng Solar 1 and Tlisitseng Solar 2 Photovoltaic (PV) Energy Facilities near Lichtenburg, North West Province.

- Visual Impact Assessment for the proposed construction of the 3000MW PhilCo Green Energy Wind Farm and Associated Infrastructure near Richmond, Northern Cape Province.

- Visual Impact Assessment for the proposed construction of the Aletta 140MW Wind Energy Facility neat Copperton, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Eureka 140MW Wind Energy Facility and associated Infrastructure near Copperton, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Eureka 400kV Substation and 400kV Power Line neat Copperton, Northern Cape Province.
- Basic Visual Impact Assessments for the proposed construction of the Tlisitseng 1 and Tlisitseng 2 Substations and Associated 132kV Power Lines near Lichtenburg, North West Province.
- Basic Visual Impact Assessment for the proposed construction of up to a 132kV Power Line and Associated Infrastructure for the Rooipunt Solar Thermal Power Plant near Upington, Northern Cape Province.
- Basic Visual Impact Assessment for the proposed construction of up to a 132kV Power Line and Associated Infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberly, Free State and Northern Cape Provinces.
- Surface Water Assessment for the Steve Thswete Local Municipality, Mpumalanga Province.
- Surface Water Delineation and Assessment for the proposed coal Railway Siding at the Welgedacht Marshalling Yard and associated Milner Road Upgrade near Springs, Ekurhuleni Metropolitan Municipality.

CURRICULUM VITAE

Name	Andrea Gibb
Profession	Environmental Practitioner
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Environmental Practitioner and Visual Specialist: Environmental Division
Years with Firm	6 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)
Coursework**:** Project Management, Environmental Risk Assessment and Management, Ecological and Social Impact Assessment, Fundamentals of Environmental Science, Impact Mitigation and Management, Integrated Environmental Management Systems & Auditing, Integrated Environmental Management, Research Methodology.
Research Proposal**:** Golf Courses and the Environment

BSc Landscape Architecture (with distinction) (University of Pretoria 2004-2007)
Coursework: Core modules focused on; design, construction, environmental science, applied sustainability, shifts in world paradigms and ideologies, soil and plant science, environmental history, business law and project management.
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

Aug 2010 – to date	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

Specialising in the field of Environmental Management and Visual Assessment.

Andrea joined SiVEST in August 2010 and holds the position of Environmental Practitioner in the Johannesburg Office. She has 8.5 years' work experience and specialises in managing large scale multifaceted EIAs and Basic Assessment (BAs), primarily related to renewable energy generation and electrical distribution. She also specialises in undertaking visual impact and landscape assessments. She has extensive experience in overseeing public participation and stakeholder engagement processes and has been involved in environmental baseline assessments, fatal flaw / feasibility assessments and environmental negative mapping / sensitivity analyses. From a business and administrative side, Andrea is actively involved in maintaining good client relationships, mentoring junior staff and maintaining the financial performance of the projects she leads.

Skills include:

- Project Management (MS Project)
- Environmental Impact Assessment (EIA)
- Basic Assessment (BA)
- Public Participation Management
- Visual Impact Assessment (VIA)
- Landscape Assessment
- Strategic Environmental Planning
- Documentation / Quality Control
- Project Level Financial Management

Projects Experience

Aug 2010 – to date

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

- 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 (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 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 (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.

OTHER

Jan 2008 – July 2010

Environmental management, research, report writing, and landscape design for several development projects:

- Report writing, coordination and public participation for several BAs.
- Planting design (including rehabilitation) in accordance with natural ecological processes, endemic species and appropriate techniques.
- Graphic presentations and mapping for several VIAs and landscape architectural designs, including three-dimensional imagery.

Feb 2006 – Dec 2006

Landscape Architectural drafting, rendering and planting design for a variety of projects including the Oprah Winfrey Academy for girls and the New UNISA Student Entrance Building.

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