PROPOSED NEW 132 KV GRID CONNECTION AND ASSOCIATED INFRASTRUCTURE FOR THE AUTHORISED EMOYENI WIND ENERGY FACILITIES IN THE NORTHERN AND WESTERN CAPE PROVINCES, SOUTH AFRICA

PREPARED BY:

Nuleaf Planning and Environmental (Pty) Ltd

PREPARED FOR:

Nala Environmental Consulting Firm

APPLICANT:

Eskom Holding SOC Ltd

DATE:

August 2022

TABLE OF CONTENTS

LIST OF TABLES

LIST OF MAPS

LIST OF FIGURES

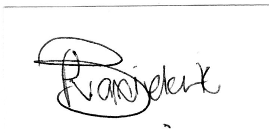
DOCUMENT CONTROL

Report Name:	Proposed New 132kv Grid Connection And Associated Infrastructure For The Authorised Emoyeni Wind Energy Facilities in the Northern and Western Cape Provinces, South Africa
VIA Specialists:	**Nuleaf Planning and Environmental (Pty) Ltd** 8A Trevor Street, Murrayfield, Pretoria, 0184 **Contact Person:** Peter Velcich Tel: 082 442 0220 Email: peter@nuleafsa.co.za
Report compiled by:	**Contact Person:** Bryony van Niekerk Tel: 074 818 9788 Email: bryony@nuleafsa.co.za **Expertise:** BSc Hons. EMA EAPASA Reg no: 2019/655
Reviewer:	**Contact Person:** Peter Velcich Tel: 082 442 0220 Email: peter@nuleafsa.co.za **Expertise:** PrLArch SACLAP Reg: 20136
GIS Consultant:	**LOGIS** 531A Witogie Street, Die Wilgers, Pretoria **Contact Person:** Lourens du Plessis Tel: 082 922 9019 Email: lourens@logis.co.za **Expertise:** GPr GISc SAGC Reg no: GPr GISc 0147.
EAP:	**Nala Environmental Consulting Firm** Kikuyu Waterfall. Johannesburg, 2090 **Contact Person:** Arlene Singh Tel: 084 277 7074 Email: arlene@veersgroup.com
Applicant:	**Eskom Holding SOC Ltd**
Report date:	18 August 2022
Report number:	04

DECLARATION

I, **Bryony van Niekerk**, as an independent consultant compiled this Visual Impact Assessment and declare that it correctly reflects the findings made at the time of the report's compilation. I further declare that I, act as an independent consultant in terms of the following:

- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act107 of 1998);
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act,1998 (Act 107 of 1998);
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, will present the results and conclusion within the associated document to the best of my professional judgement.



Bryony van Niekerk
Environmental Assessment Practitioner
EAPASA Reg nr: 2019/655

1. INTRODUCTION

1.1. QUALIFICATION AND EXPERIENCE OF THE PROFESSIONAL TEAM

Nuleaf Planning and Environmental (Pty) Ltd, specialising in Visual Impact Assessment, undertook the visual assessment for the proposed 132 kV grid connection and related infrastructure associated with the Emoyeni Wind Energy Facilities (i.e. the authorised Umsinde Emoyeni, Khangela Emoyeni and Ishwati emoyeni Winder Energy Facilities).

The team undertaking the visual assessment has extensive practical knowledge in spatial analysis, environmental modelling and digital mapping, and applies this knowledge in various scientific fields and disciplines. The expertise of these practitioners is often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

The visual assessment team is familiar with the "Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes" (Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning) and utilises the principles and recommendations stated therein to successfully undertake visual impact assessments. Although the guidelines have been developed with specific reference to the Western Cape Province of South Africa, the core elements are more widely applicable.

NuLeaf Planning and Environmental have been appointed as an independent specialist consultant to undertake the visual impact assessment. Neither the author, nor NuLeaf Planning and Environmental will benefit from the outcome of the project decision-making.

1.2. LEGAL FRAMEWORK

The following legislation and guidelines have been considered in the preparation of this report:

- The Environmental Impact Assessment Amendment Regulations, 2017;
- Guideline on Generic Terms of Reference for EAPs and Project Schedules (DEADP, Provincial Government of the Western Cape, 2011).
- Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP, Provincial Government of the Western Cape, 2005).

1.3. INFORMATION BASE

This assessment was based on information from the following sources:

- Topographical maps and GIS generated data were sourced from the Surveyor General, Surveys and Mapping in Mowbray, Cape Town;
- Observations made and photographs taken during site visits;
- Professional judgement based on experience gained from similar projects; and
- Literature research on similar projects.

1.4. ASSUMPTIONS AND LIMITATIONS

This Report has been prepared by Nuleaf on behalf, and at the request, of NALA to provide them with an independent specialist assessment. Unless otherwise agreed by Nuleaf in writing, Nuleaf does not accept responsibility or legal liability to any person other than the NALA for the contents of, or any omissions from, this Report.

To prepare this Report, Nuleaf utilised only the documents and information provided by NALA or any third parties directed to provide information and documents by NALA. Nuleaf has not consulted any other documents or information in relation to this Report, except where otherwise indicated.

The findings, recommendations and conclusions given in this report are based on the author's best scientific and professional knowledge, as well as, the available information. This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken. Nuleaf and

its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from on-going research or further work in this field, or pertaining to this investigation.
Although Nuleaf exercises due care and diligence in rendering services and preparing documents, Nuleaf accepts no liability, and NALA, by receiving this document, indemnifies Nuleaf and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with the services rendered, directly or indirectly by the use of the information contained in this document.

This report may not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If this report is used as part of a main report, the report in its entirety must be included as an appendix or separate section to the main report.

This assessment was undertaken during the planning stage of the project and is based on information available at that time. It is assumed that all information regarding the project details provided by NALA and the Applicant is correct and relevant to the proposed project. Some assumptions have to be made about the project as the layout is only indicative at this stage. Approximate building footprints have been provided, but architectural details of the buildings would only become available over time as the project proceeds. As such, this Visual Impact Assessment and all associated mapping has been undertaken according to the worst-case scenario.

1.5. LEVEL OF CONFIDENCE

Level of confidence[1] is determined as a function of:

- The information available, and understanding of the study area by the practitioner:
  - **3**: A high level of information is available of the study area and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.
  - **2**: A moderate level of information is available of the study area and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.
  - **1**: Limited information is available of the study area and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.
- The information available, understanding of the project and experience of this type of project by the practitioner:
  - **3**: A high level of information and knowledge is available of the project and the visual impact assessor is well experienced in this type of project and level of assessment.
  - **2**: A moderate level of information and knowledge is available of the project and the visual impact assessor is moderately experienced in this type of project and level of assessment.
  - **1**: Limited information and knowledge is available of the project and the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

		Information on the project & experience of the practitioner		
Information on the study area		**3**	**2**	**1**
	3	9	6	3
	2	6	4	2
	1	3	2	1

Table 1: Level of confidence

The level of confidence for this assessment is determined to be **9** and indicates that the author's confidence in the accuracy of the findings is Moderate to High:

[1] Adapted from Oberholzer (2005).

- The information available, and understanding of the study area by the practitioner is rated as **3**
- The information available, understanding and experience of this type of project by the practitioner is rated as **3**

2. METHODOLOGY

The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed development. A detailed Digital Terrain Model (DTM) for the study area was created from 5m interval contours from the National Geo-spatial Information data supplied by the Department: Rural Development and Land Reform.

The approach utilised to identify potential issues related to the visual impact included the following activities:

- Undertaking a site visit;
- The creation of a detailed digital terrain model (DTM) of the potentially affected environment;
- The sourcing of relevant spatial data. This includes cadastral features, vegetation types, land use activities, topographical features, site placement, etc.;
- The identification of sensitive environments upon which the proposed infrastructure could have a potential visual impact;
- The creation of viewshed analyses from the proposed study area in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analyses take into account the dimensions of the proposed structures.

This report (visual impact assessment) sets out to identify and quantify the possible visual impacts related to the proposed New 132kV Grid Connection and Associated Infrastructure for The Authorised Emoyeni Wind Energy Facilities, as well as, offer potential mitigation measures, where required.

The following methodology has been followed for the assessment of visual impact:

UNDERTAKE A SITE VISIT

A site visit was undertaken in order to verify the results of the spatial analyses and to identify any additional site-specific issues that may need to be addressed in the VIA report. The season was not a consideration, nor had any effect on the carrying out of the visual assessment. A photographic survey was made of the site and surrounding potentially affected area from several selected viewpoints. The site visit was undertaken on the 03 April 2022.

DETERMINE THE POTENTIAL VISUAL EXPOSURE

The visibility or visual exposure of any development is the point of departure for the visual impact assessment. It stands to reason that if the proposed development were not visible, no impact would occur.

Viewshed analyses of the proposed development indicates the potential visibility.

DETERMINE THE VISUAL DISTANCE AND OBSERVER PROXIMITY

In order to refine the visual exposure of the development on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence.

Proximity radii for the proposed alignment corridors are created in order to indicate the scale and viewing distance of the development and to determine the prominence thereof in relation to their environment.

The visual distance theory and the observer's proximity to the development are closely related, and especially relevant, when considered from areas with a high viewer incidence and a predominantly negative visual perception of the proposed development.

DETERMINE VIEWER INCIDENCE, PERCEPTION AND SENSITIVITY

The number of observers and their perception of a development determine the concept of visual impact. If there are no observers, then there would be no visual impact. If the visual perception of a structure is favourable to all observers, then the visual impact would be positive.

It is therefore necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed development and its related infrastructure.

It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer; regularity of sighting, cultural background, state of mind, and purpose of sighting which would create a myriad of options.

DETERMINE THE VISUAL ABSORPTION CAPACITY (VAC)

This is the capacity of the receiving environment to absorb the potential visual impact of the proposed development. The digital terrain model utilised in the calculation of the visual exposure of the development does not incorporate the potential visual absorption capacity (VAC) of the natural vegetation of the region. It is therefore necessary to determine the VAC by means of the interpretation of the vegetation cover and other landscape characteristics.

DETERMINE THE VISUAL IMPACT INDEX OF THE PROPOSED INFRASTRUCTURE

The results of the above analyses are merged in order to determine where the areas of likely visual impact would occur. These areas are further analysed in terms of the previously mentioned issues (related to the visual impact) and in order to judge the magnitude of each impact.

DETERMINE THE IMPACT SIGNIFICANCE

The potential visual impacts identified and described are quantified in their respective geographical locations in order to determine the significance of the anticipated impact. Significance is determined as a function of extent, duration, magnitude and probability.

FORMULATION OF MITIGATION MEASURES

Recommendation of mitigation measures (if possible) to avoid or minimise potential negative visual impacts of the Proposed New 132kV Grid Connection and Associated Infrastructure for the Authorised Emoyeni Wind Energy Facilities, for inclusion in the EMPr and authorisation conditions.

3. PROJECT DESCRIPTION

Eskom Holding SOC Ltd is proposing the development of 132 kV overhead powerlines, three (3) 132 kV on-site substations (switching stations), new access/service tracks and watercourse crossing points associated with the authorized Umsinde Emoyeni, Ishwati EMoyeni and Khangela Emoyeni Wind Energy Facilities.

The proposed project will consist of the following:

- The establishment of a 132kV collector substation (switching station) within the authorised Umsinde Emoyeni WEF site (adjacent to the WEF facility substation) with a footprint of approximately 100m X 80m (~0.8ha) to be located within an assessment footprint that encompasses a 300m radius.

- The establishment of a 132kV collector substation (switching station) within the authorised Khangela Emoyeni WEF site (adjacent to the WEF facility substation) with a footprint of approximately 100m X 80m (~0.8ha) to be located within an assessment footprint that encompasses a 300m radius.

- The establishment of a 132kV collector substation (switching station) within the authorised Ishwati Emoyeni WEF site (adjacent to the WEF facility substation) with a footprint of approximately 120m X 100m (~1.2 ha) with an assessment footprint that encompasses a 300m radius.

- The establishment of a 132kV powerline within a 400m wide corridor that will extend from the Khangela switching station to the Ishwati switching station (36km), and then onward for 25km to the Eskom Gamma Substation. In addition, a further length of 132kV powerline (within a 400m wide corridor) will extend from the Umsinde switching station to the Khangela switching station for 8km OR it may connect directly into the Khangela-Ishwati powerline at the Khangela switching station. An extended powerline development corridor of approximately 1,91 km^2 wide has been assessed in the vicinity of the Gamma Substation, that will enable the 132kV powerline to connect to either the south face of the Gamma Substation yard or approach from the east. The 132kV Powerline from Umsinde to Khangela, and from Khangela to Ishwati and onward to Gamma Substation will be a single- or double-circuit powerline, with a single set of pylons structures with a maximum height of 35m. Access/service tracks (jeep track) up to 7m wide and associated watercourse crossings will be associated with the powerline, and will be located within the assessed powerline corridor.

- The establishment of a new access road approximately 14km long from the existing public road from Richmond to the authorised Ishwati Emoyeni on-site substation site. The proposed new access road will be unsealed and up to 12m wide during construction , but will be reduced to a maximum of 6 m width during operation.

Two (2) alternatives are also being considered, which deviate slightly from the Preferred Alternative alignment. Refer to Figure 1:

- The Preferred Alternative= red (From Umsinde on-site switching station to Khangela on-site switching station to the Ishwati onsite switching station to the Gamma Substation)
- Alternative 1= red+ light blue+ red (From Umsinde on-site switching station to Khangela on-site switching station to the Ishwati onsite switching station to the Gamma Substation)
- Alternative 2= red+ light blue+ green+ red (From Umsinde on-site switching station to Khangela on-site switching station to the Ishwati onsite switching station to the Gamma Substation)

Please note the overhead power line will be assessed as single alignment, i.e. from the Umsinde collector substation to the Gamma substation, however due to the scale and ease of reference, the alignment has been broken down into three components for ease of mapping. These components will be the Umsinde-Khangela OHL, Khangela-Ishwati OHL and the Ishwati-Gamma OHL.

Figure 1: Overview of the proposed grid connection and infrastructure and alternatives

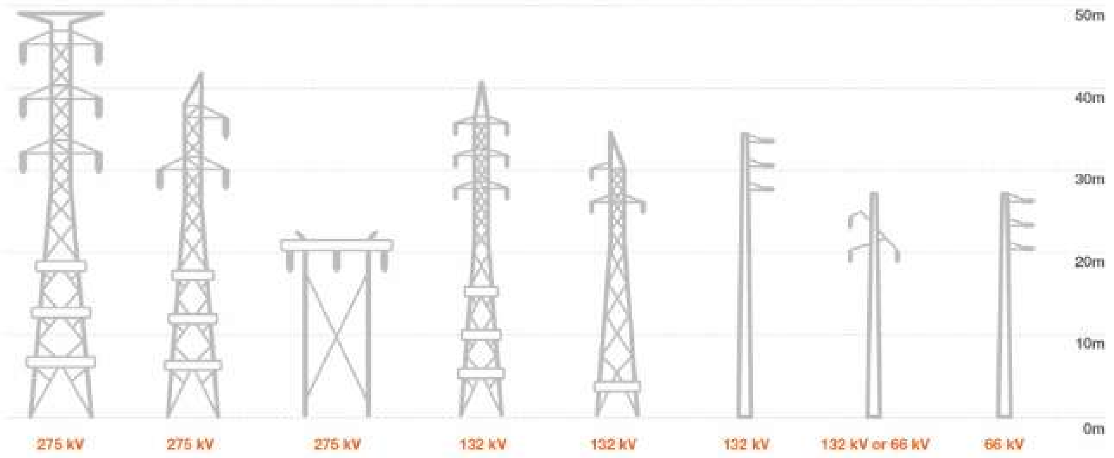


Figure 2: Typical illustration of a 132 kV powerline[2]

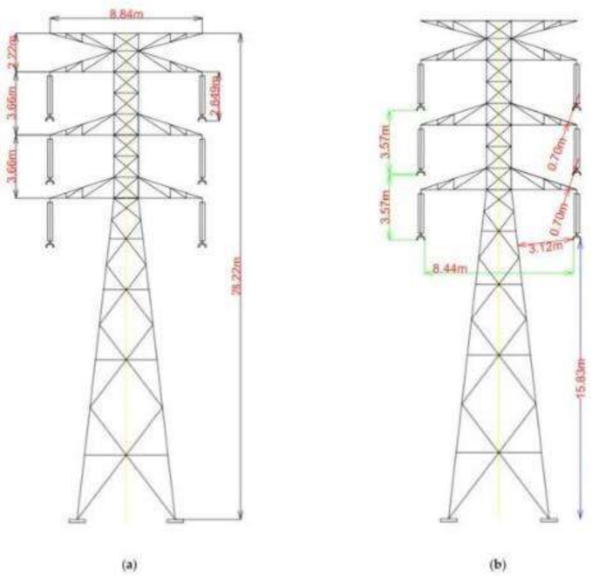
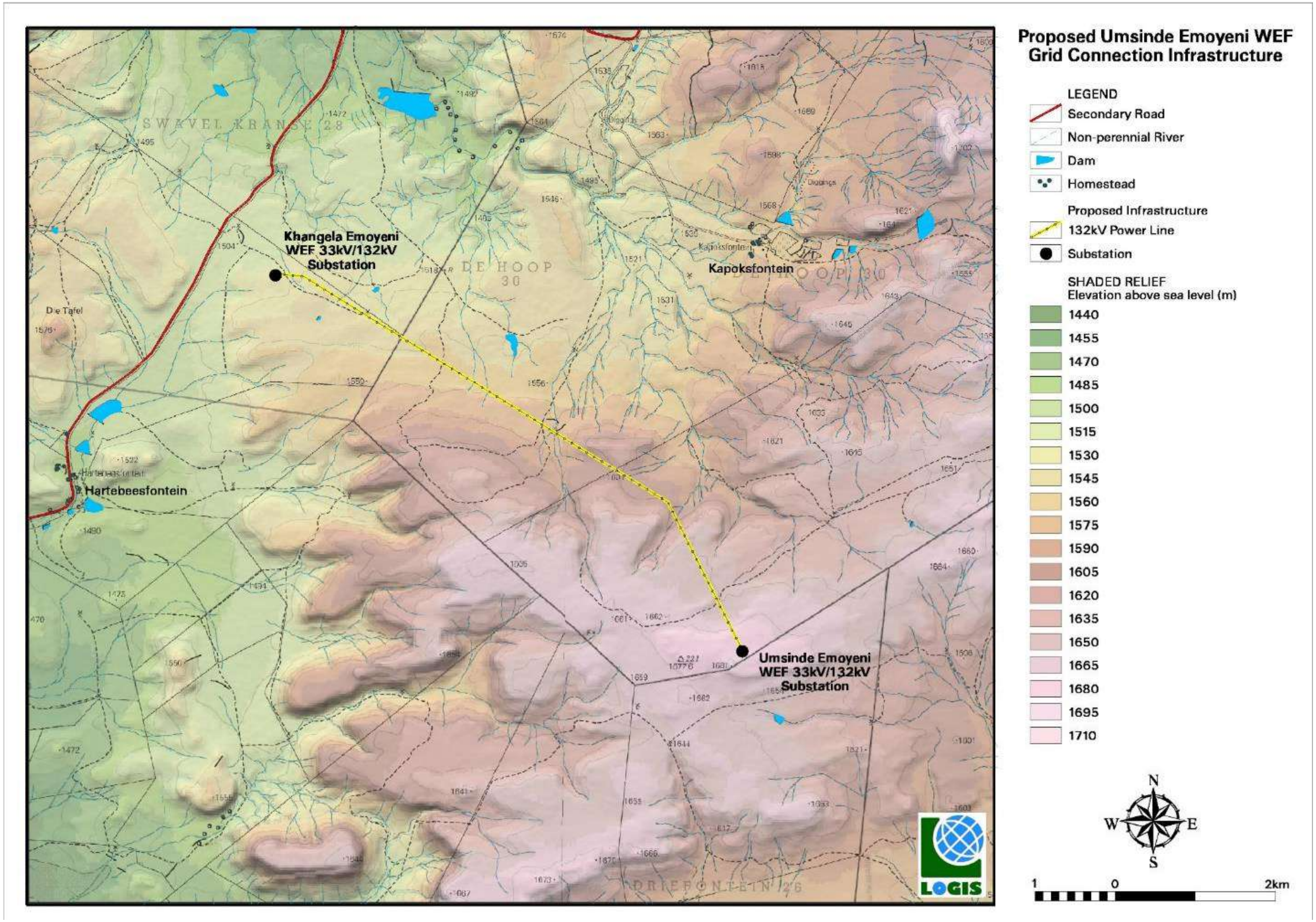


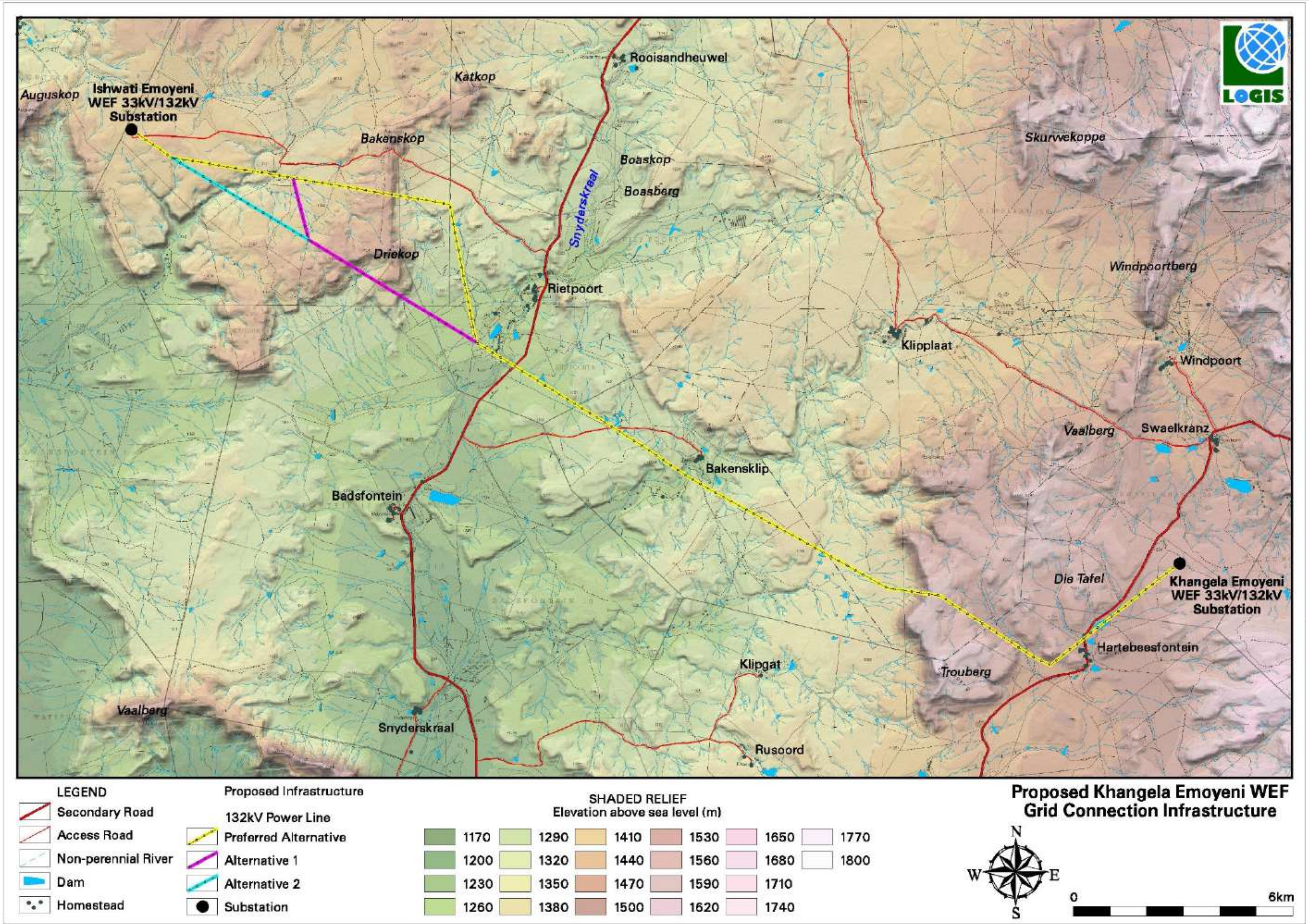
Figure 3: Illustration of a typical 132 kV powerline Tower[3]

2 *Illustration courtesy of BEETEE Projects https://beeteeprojects.co.za/with-the-variety-of-power-lines-are-there-a-variety-of-bird-guards/*

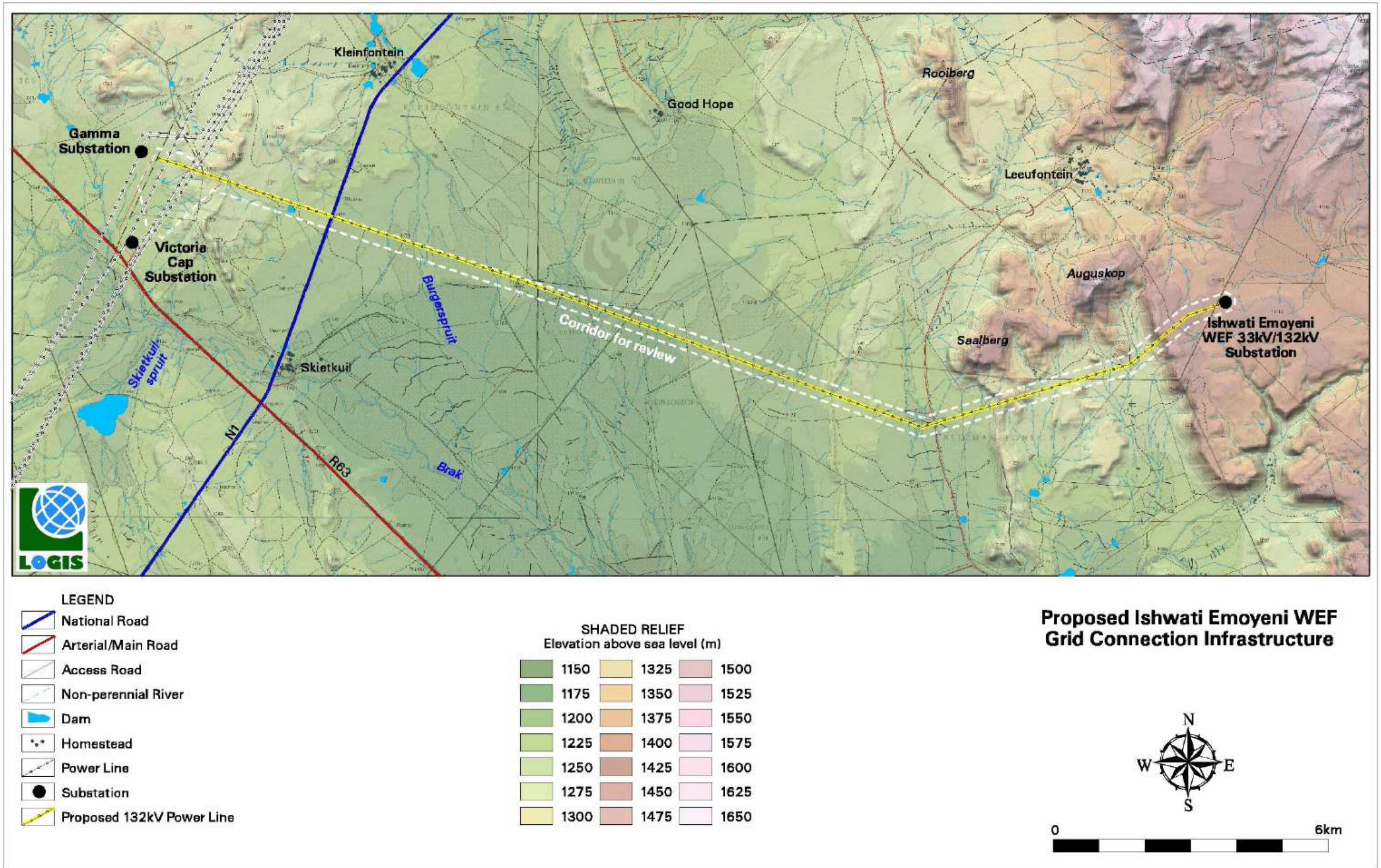
3 *illustration courtesy of Nor SFM, Kadir MZAA, Ariffin AM, Osman M, Rahman MSA, Zainuddin NM. Issues and Challenges in Voltage Uprating for Sustainable Power Operation: A Case Study of a 132 kV Transmission Line System in Malaysia. Sustainability. 2021; 13(19):10776. https://doi.org/10.3390/su131910776*



Map 1: Shaded relief map of the proposed area from Umsinde to Khangela substations (switching stations)



Map 2: Shaded relief map of the proposed area from Khangela to Ishwati substations (switching stations)



Map 3: Shaded relief map of the proposed area from Ishwati to Gamma substations

4. SCOPE OF WORK

The scope of work for this assessment includes the determination of the potential visual impacts in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure. Mitigation measures are recommended where appropriate.

Anticipated issues related to the potential visual impact of the proposed powerlines and substations include the following:

- The visibility of the proposed infrastructure to, and potential visual impact on, users of national roads (N1), arterial roads (R63) and secondary roads.
- The visibility of the proposed infrastructure to, and potential visual impact on residents of farmsteads and settlements.
- The potential visual impact of associated infrastructure (i.e. access roads and cleared servitudes) on sensitive visual receptors.
- Potential visual impacts associated with the construction phase on observers in close proximity to the proposed power lines and substations.
- The potential visual impact of operational, safety and security lighting of the facility at night.
- The potential visual impact of the proposed infrastructure on the visual quality of the landscape and sense of place of the region.
- Potential residual visual impacts after the decommissioning of the proposed power lines.
- The potential to mitigate visual impacts and inform the design process.

It is envisaged that the issues listed above may constitute a visual impact at a local scale.

5. THE AFFECTED ENVIRONMENT

The Proposed New 132kv Grid Connection and Associated Infrastructure are located approximately 20 Km north of Murraysburg within the Central Karoo District Municipality in the Western Cape Province.

The topography of the study area is undulating with mountainous areas at the start of the power line in the vicinity of the proposed Umsinde switching station whereby the OHL traverses a high lying area of 1710 metres above mean sea level (m.a.m.s.l.) where it connects to the Khangela switching station. From here the OHL traverses over Trouberg, passes between Driekop and Bakenskop where it connects to the Ishwati switching station. The elevation ranges from 1500 to 1230 m.a.m.s.l From the Ishwati switching station the OHL travels over slightly lower lying land to the Gamma substation. Elevation is approximately 1200 m.a.m.s.l.

Land cover consists predominately of shrubland and bare rock and soil. Near the centre of the line small areas of erosion, grassland and agriculture can be found. The study area is located predominately within the Nama Karoo biome, with rainfall ranging from 123 mm -248 mm per annum. The vegetation type is classified as Eastern Upper Karoo which is a mix of grass and shrub with small portions of Southern Karoo Riviere.

The majority of the study area is sparsely populated and consists of a landscape of wide-open expanses. The scarcity of water and other natural resources has influenced settlement within this region, keeping numbers low, and distribution limited to the availability of permanent water. Settlements, where they occur, are usually rural homesteads and farmsteads.

Access to the study area is via the N1 and secondary roads which link with one another, providing access to farmsteads.

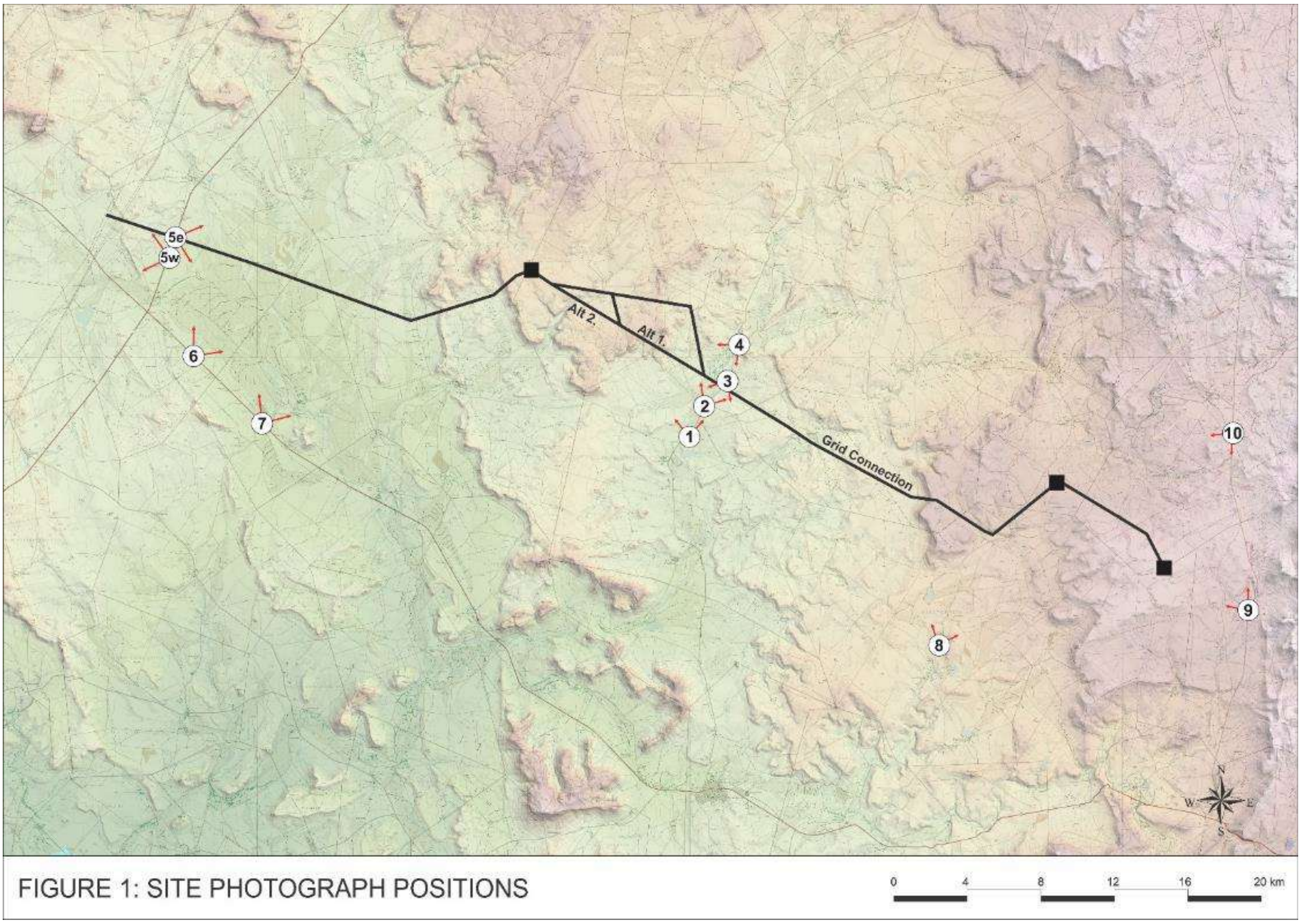


Figure 4: Site photograph positions

Other industrial infrastructure within the study area includes the existing Gamma and Victoria Cap Substations in the west of the study area. Additionally existing high voltage power lines traverse the study area in the west from north to south.

The N1 is a national road and is the main link from Gauteng to Cape Town. Seeing as the N1 is a main route serving the region, it can be considered to be a route that is most likely to carry tourists. The R63 can also be considered an alternative route to Graaf-Reinet which is a popular tourist town located within the Camdeboo National Park in the Eastern Cape Province.

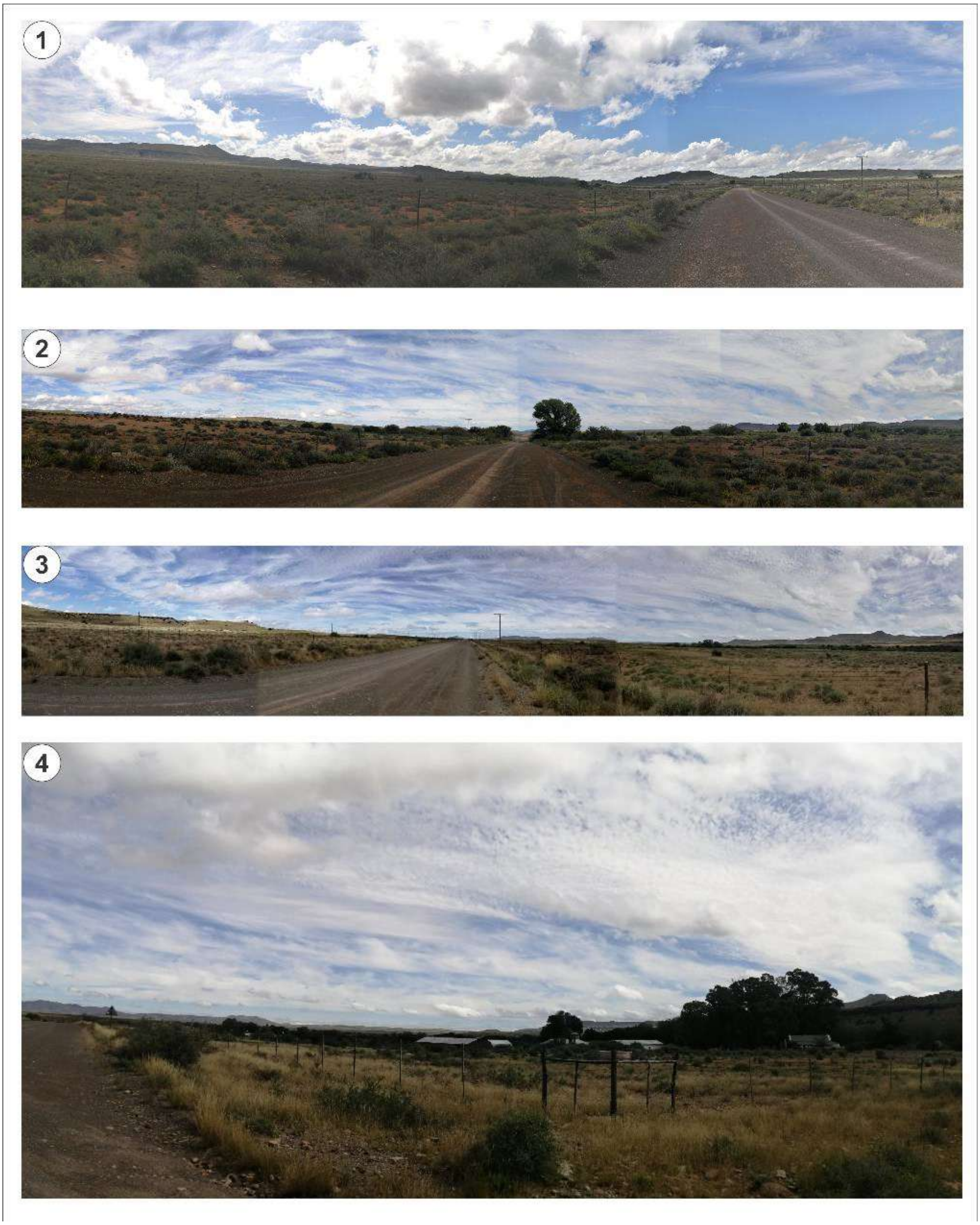


Figure 5: Overview of the centre of the alignment between Khangela and Ishwati

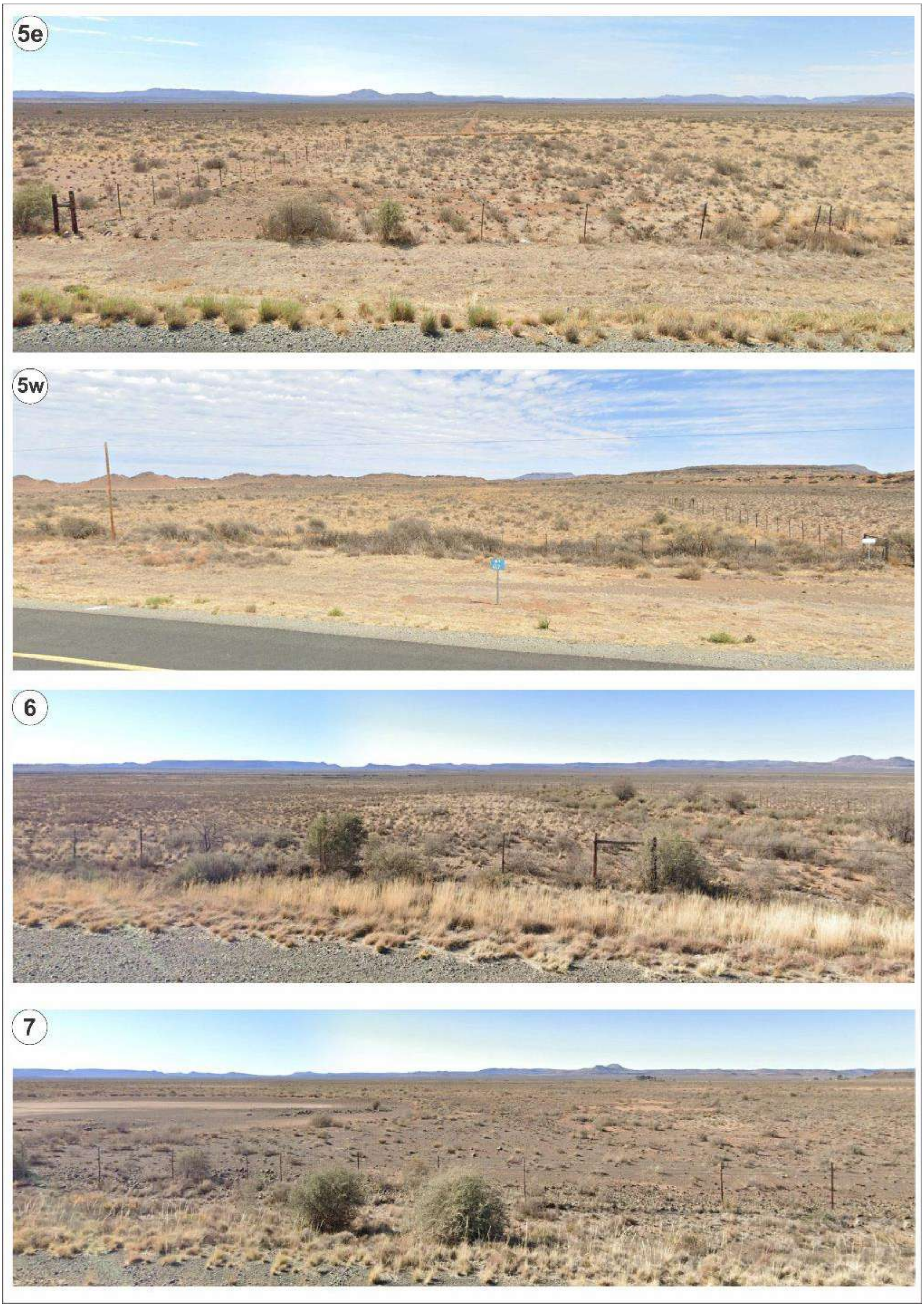


Figure 6: Overview of the alignment from Ishwati to Gamma substations

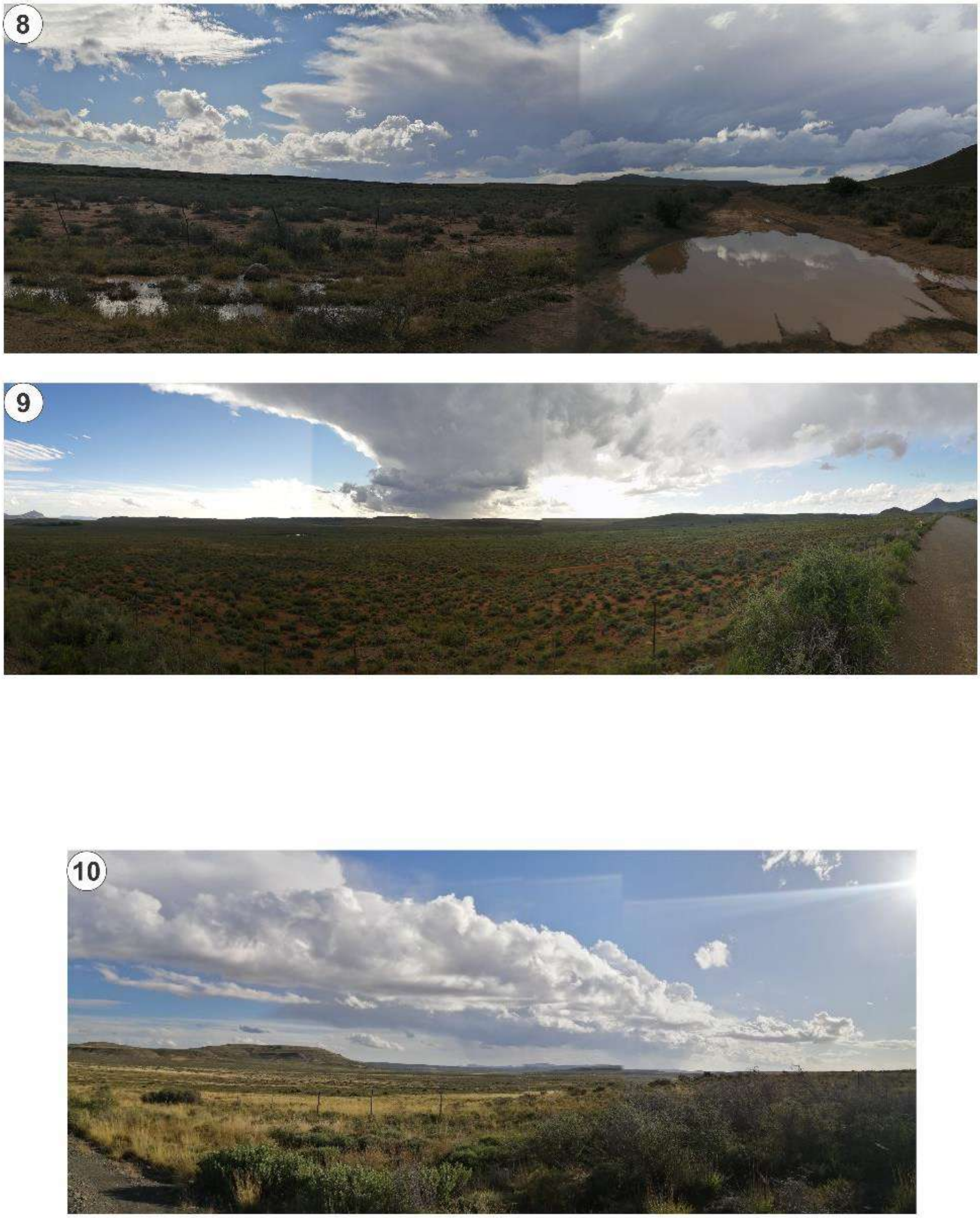
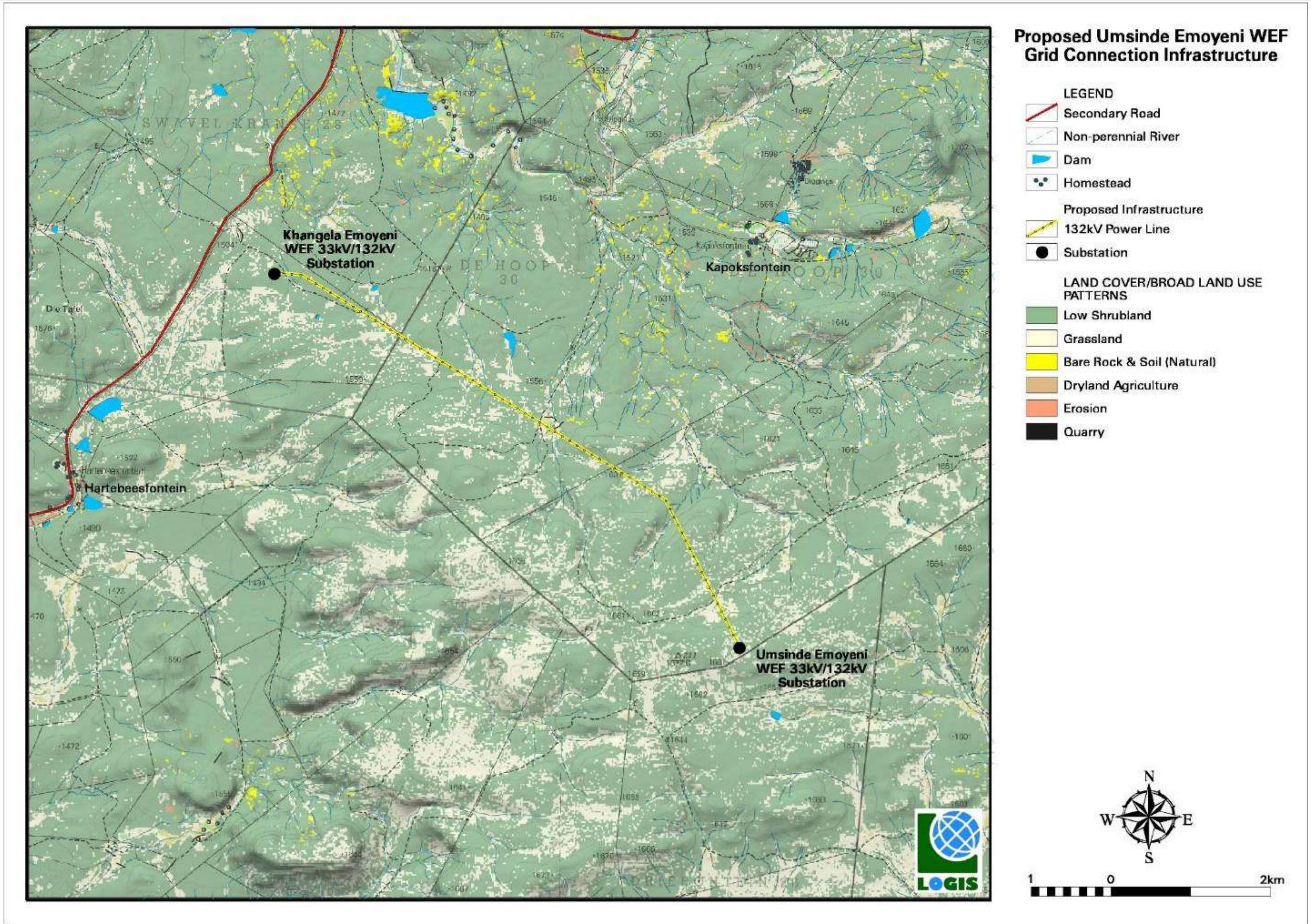
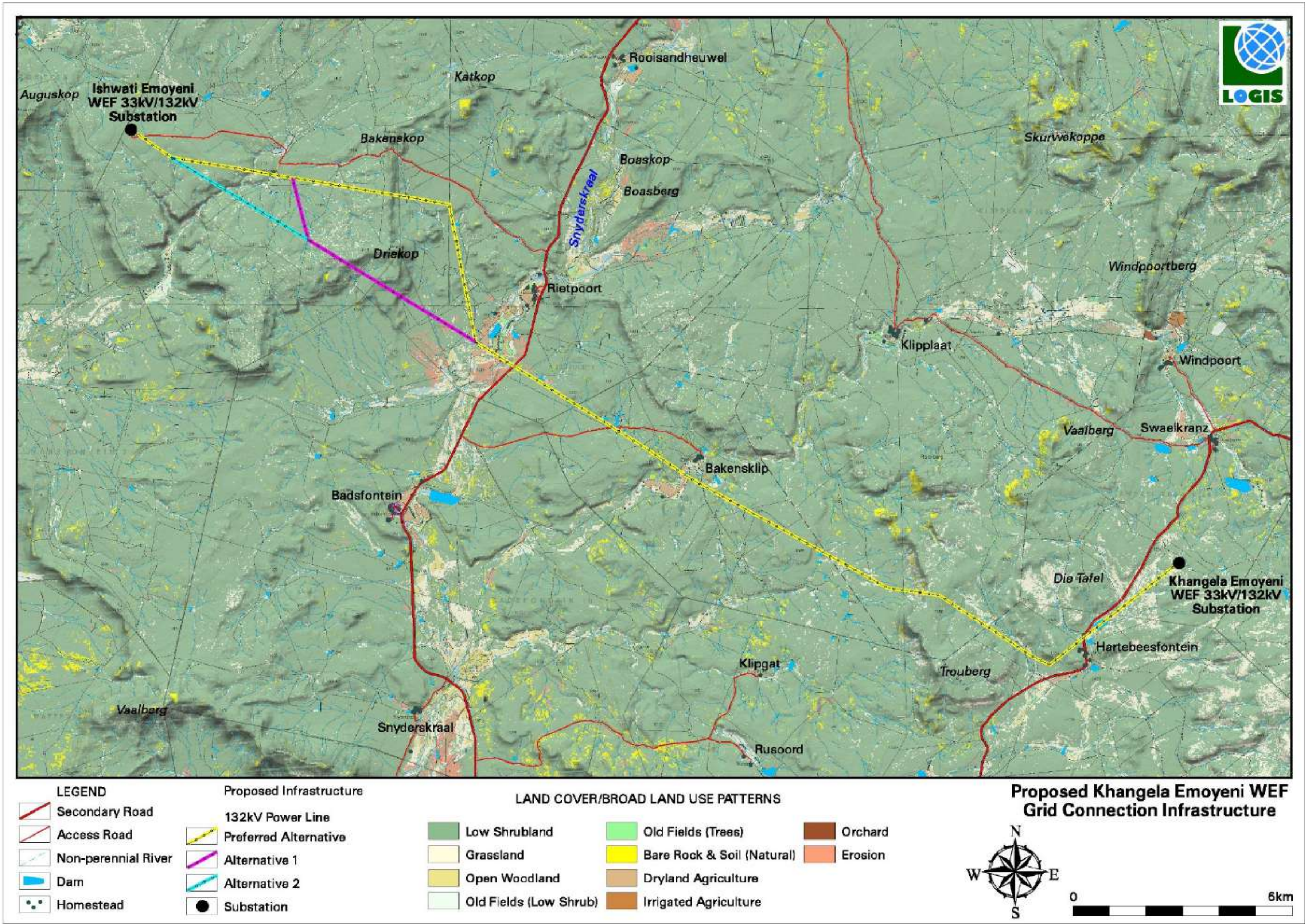


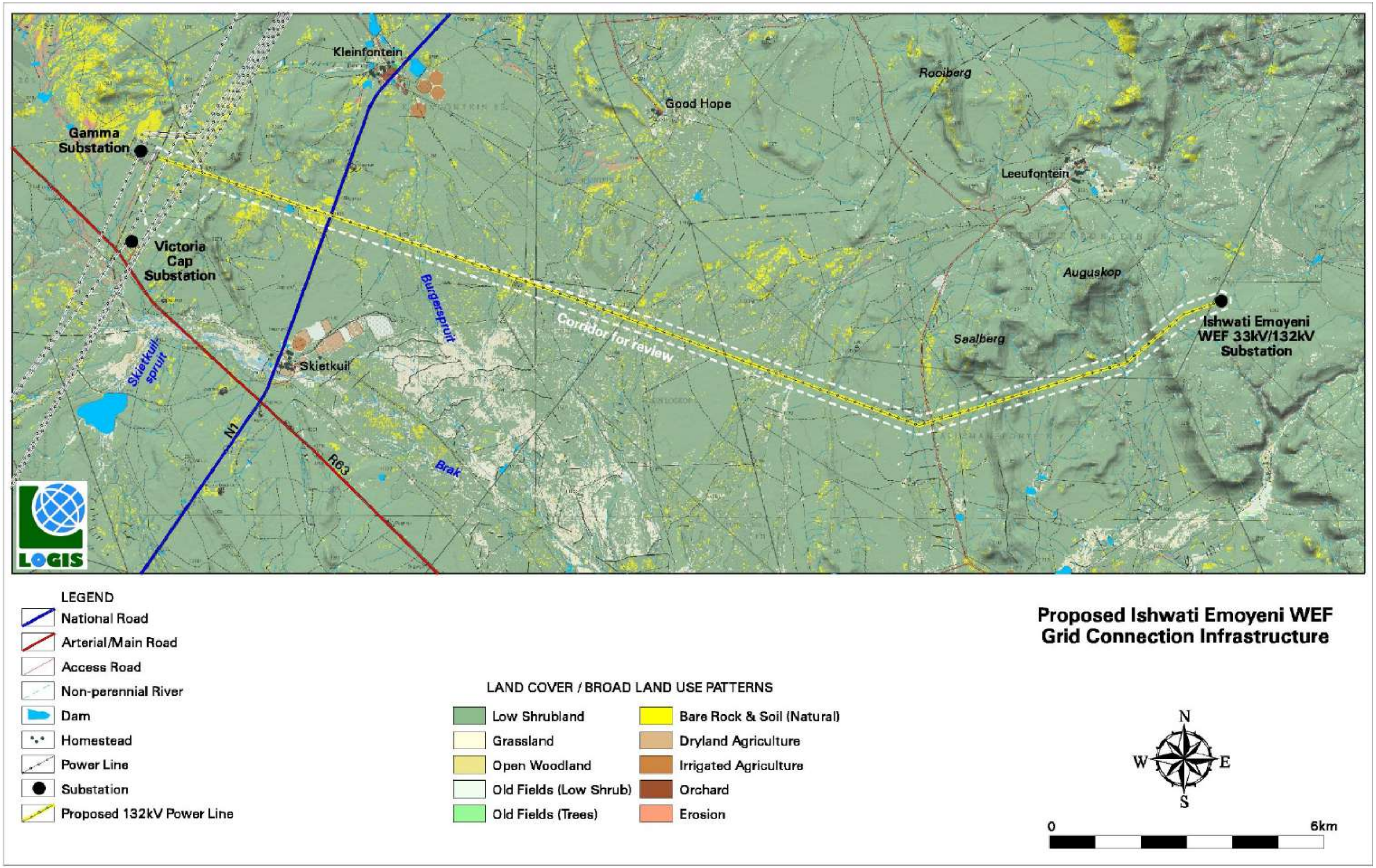
Figure 7: Overview of the alignment from Umsinde to Khangela



Map 4: Land cover/broad land use patterns of the study area, Umsinde to Khangela switching stations



Map 5: Land cover/ broad land use patterns for the study area, Khangela to Ishwati switching stations



Map 6: Land cover/ broad land use patterns of the study area; Ishwati to Gamma substations

6. VIEWSHED ANALYSIS

6.1 VISUAL DISTANCE AND OBSERVER PROXIMITY

Nuleaf Planning and Environmental determined proximity offsets based on the anticipated visual experience of the observer over varying distances. In general, the severity of the visual impact on visual receptors decreases with increased distance from the proposed infrastructure. Therefore, in order to refine the visual exposure of the proposed substation and powerlines on surrounding areas/receptors, the principle of reduced impact over distance is applied. This allows for a core area of visual influence for the proposed substation and powerlines to be determined. Proximity offsets for the proposed alignments are thus established in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment.

These proximity offsets are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger facilities and downwards for smaller facilities (i.e. depending on the size and nature of the proposed infrastructure).

The proximity offsets (calculated from the centre line of each power line alignment) are as follows:

- 0 – 0.5km. Short distance view where the infrastructure would dominate the frame of vision and constitute a very high to high visual prominence.
- 0.5 – 1.5km. Medium distance view where the infrastructure would be easily and comfortably visible and constitute a high to moderate visual prominence.
- 1.5 – 3km. Medium to longer distance view where the infrastructure would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a medium visual prominence.
- Greater than 3km. Long distance view where the structures may still be visible though not as easily recognisable. This zone constitutes a low visual prominence for the power line.

Refer to **Maps 7, 8 and 9.**

6.2 VIEWER INCIDENCE, PERCEPTION AND SENSITIVITY

Since the number of potential sensitive receptors and their perception of the development in question ultimately determines the concept of a visual impact (i.e. without receptors there would be no impact), the visual distance theory and the receptors proximity to the development works hand in hand and is especially relevant when considered from areas with a high viewer incidence and a potentially negative visual perception of the proposed facility. It is, therefore, necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed solar energy facility.

Viewer incidence is calculated to be the highest along the National and secondary roads within the study area, as well as homesteads/dwellings within the area. Commuters and possible tourists using these roads may be negatively impacted upon by the visual exposure to the proposed infrastructure.

Homesteads and farmsteads, by virtue of their visually exposed nature, are also considered to be sensitive visual receptors. Residential receptors in natural contexts are more sensitive than those in more built-up contexts, due to the absence of visual clutter in these undeveloped and undisturbed areas. Receptors within built up areas are less sensitive to potential visual impact due to the presence of structures, infrastructure and general visual clutter. However, due to the extremely low density of homesteads/dwellings within the immediate area (within 0.5 Km), it is highly unlikely that any residents would be negatively impacted.

No specific report can be made on viewer perception regarding the Proposed New 132kv Grid Connection and Associated Infrastructure For The Authorised Emoyeni Wind Energy Facilities, as no reported stakeholder feedback has been received by the specialist. However, considering there are existing high voltage power lines traversing the study area and the low number of sensitive visual receptors, an overall neutral perception is anticipated.

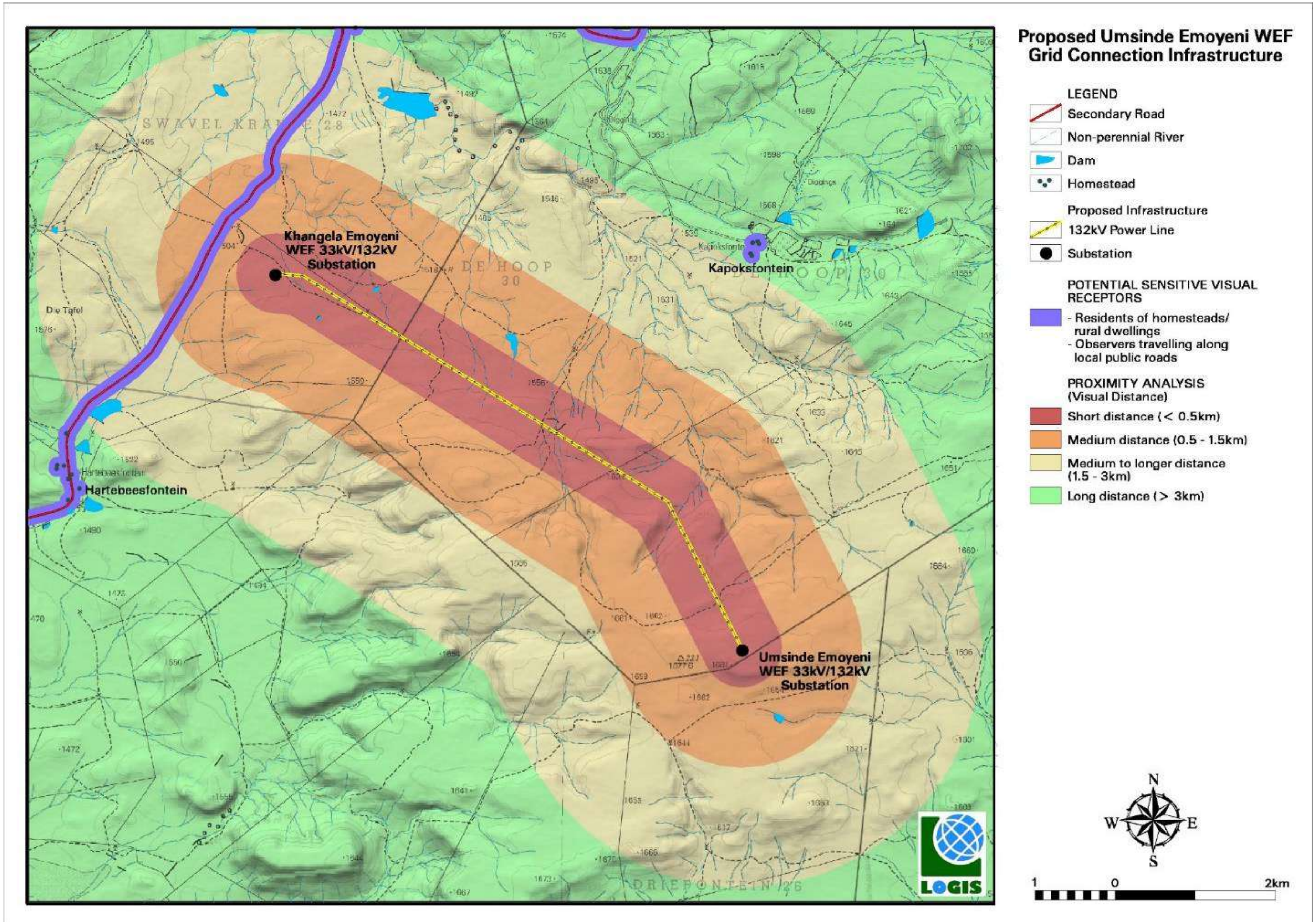
The potential sensitive visual receptors within a 0.5km, 1.5km and 3km radius as identified on **7, 8 and 9** are as follows:

- < 0.5km – Short Distance
  Observers travelling along the N1 and secondary roads, as well as, residents of Bakensklip, Hartebeesfontein and an unknown dwelling/homestead.

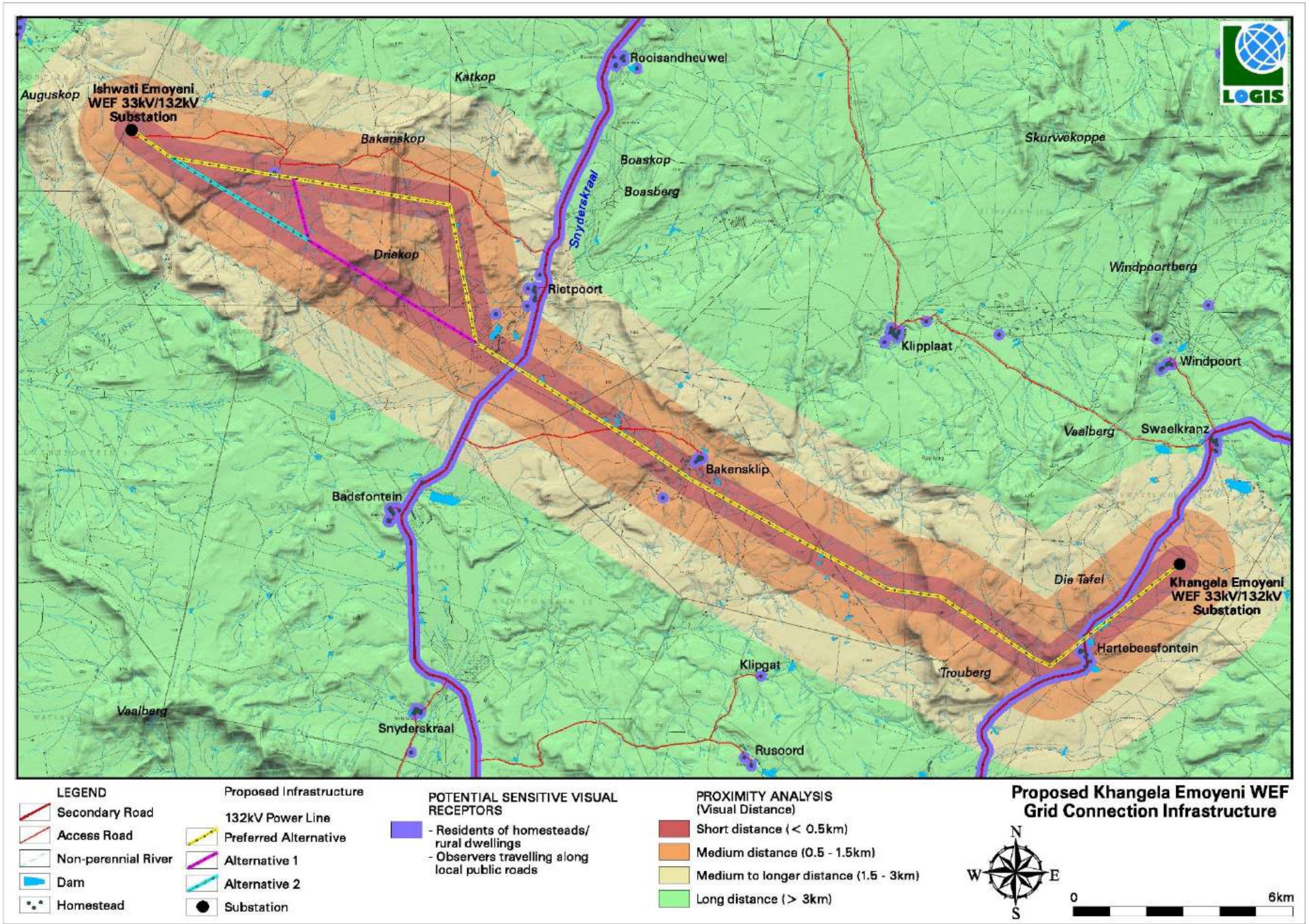
- 0.5 – 1.5km – Short to Medium Distance
  Observers travelling along the N1 and secondary roads as well as residents of unknown dwelling/homesteads within 1.5 km of the proposed grid connection infrastructure.

- 1.5 - 3km – Medium to Long Distance
  Residents of Rietpoort, as well as observers travelling along the N1, R63 and secondary roads.

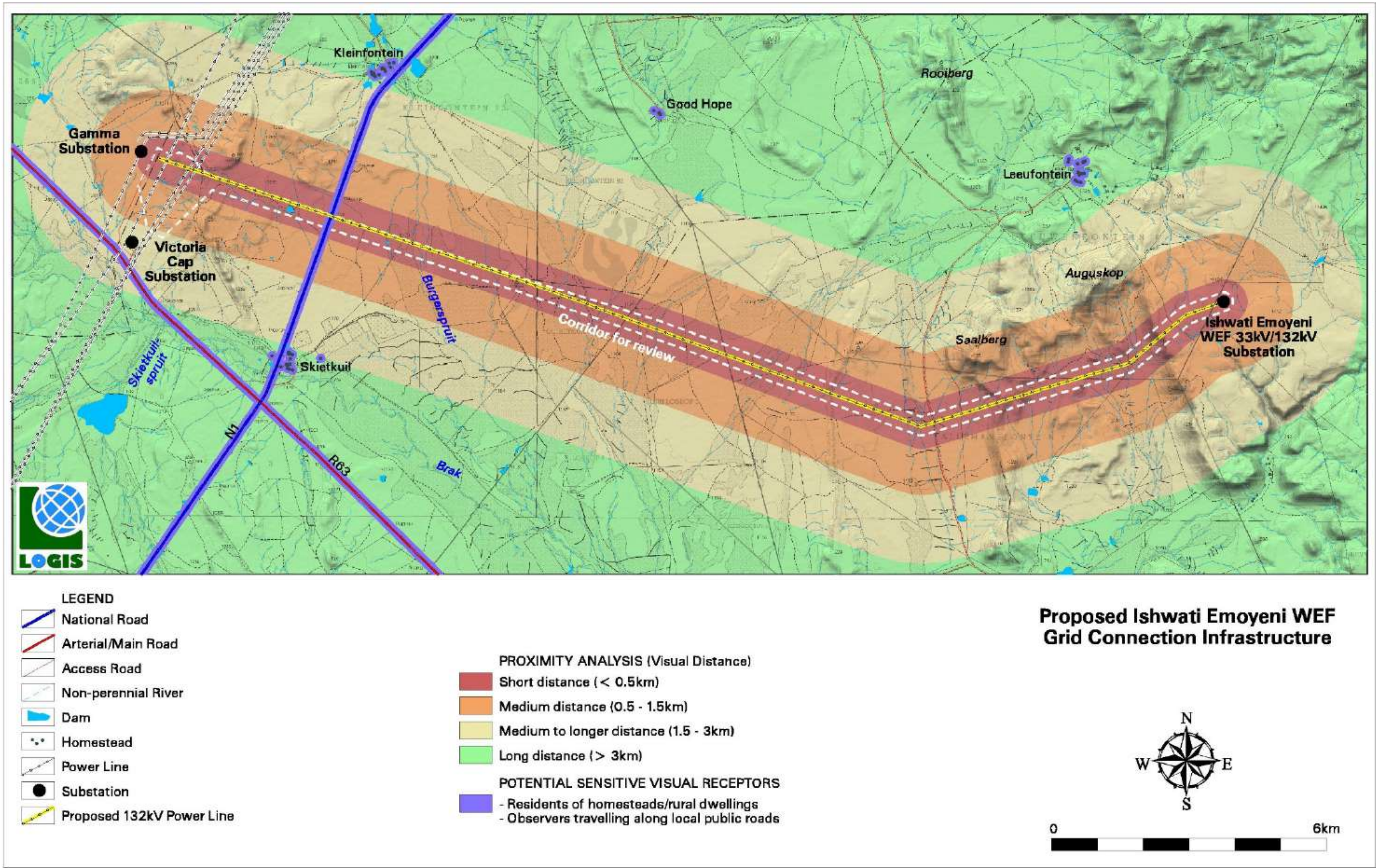
- > 3km – Long Distance
  Residents homesteads/dwellings within the area (Kapoksfontein, Rusoord, Klipgat, Snyderskraal, Badsfontein, Swaelkranz, Klipplaat, Leeufontein, Skietkuil, Kleinfontein, and observers travelling along the N1, R63 and secondary roads.



Map 7: Visual proximity analysis of the proposed alignment- Umsinde to Khangela switching stations



Map 8: Visual proximity analysis of the proposed alignment- Khangela to Ishwati switching stations



Map 9: Visual proximity analysis for the proposed alignment- Khangela to Gamma Substations

6.3 VISUAL ABSORPTION CAPACITY

Visual Absorption Capacity (VAC) is the capacity of the receiving environment to absorb the potential visual impact of the proposed infrastructure. VAC is primarily a function of the vegetation and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC. The VAC would also be high where the environment can readily absorb the development in terms of texture, colour, form and light / shade characteristics. On the other hand, the VAC for a development contrasting markedly with one or more of the characteristics of the environment would be low. The VAC also generally increases with distance, where discernible detail in visual characteristics of both environment and development decreases.

The land cover within the study area is predominately low shrubland and bare rock and soil with small scattered areas of dryland agriculture. As a result, the landscape is characterised by wide-open expanses of extreme isolation. Overall, the Visual Absorption Capacity (VAC) of the receiving environment is deemed to be low by virtue of the low growing vegetation and sparsely populated/limited development overall.

The significant height of power line structures adds to the potential visual intrusion of the power lines, with the tall towers (pylons) against the background of the horizon. In addition, the scale and form of the structures mean that it is unlikely that the environment will visually absorb them in terms of texture, colour, form and light/shade characteristics.

Overall, the Visual Absorption Capacity (VAC) of the receiving environment and the areas in close proximity to the proposed powerline alignments is deemed to be low by virtue of the low-growing vegetation.

Where homesteads do occur, some more significant vegetation and trees may have been planted, which would contribute to the visual absorption. As this is not a consistent occurrence and majority of the settlements are informal in nature, VAC will not be taken into account for any of the homesteads or settlements, again assuming a worst-case scenario.

As a result of the low lying vegetation, undeveloped nature of the study area, and the high contrast of the infrastructure within the surrounding receiving environment, VAC will not be taken into account for the visual impact assessment of the new 132kv Grid Connection and Associated Infrastructure.

6.4 POTENTIAL VISUAL EXPOSURE

The result of the viewshed analyses for the proposed New 132kv Grid Connection and Associated Infrastructure is shown on **10, 11 and 12** that follows. An analysis has been undertaken within the proposed 400 m assessment corridor in order to determine the general visual exposure (visibility) of the area under investigation. A generic height of 45m was used in order to illustrate the anticipated visual exposure of the proposed infrastructure (i.e. the maximum height of the power line structures). The visibility analysis for each alignment was generated from a number of points along the alignment, spaced at intervals of approximately 400m. Receptor height was set at eye level.

The height of the substations (switching stations) will not exceed two storeys (i.e. 6m), therefore the visual exposure of this component will fall within the viewshed generated for the power line alignments.

The viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed infrastructure, therefore signifying a worst-case scenario.

Maps 10,11 and 12 indicates that the proposed grid connection infrastructure will be visually exposed to some extent within the study area, due to the tall power line infrastructure. It is thus anticipated that the infrastructure would be visible to observers (i.e. people travelling along roads, residing in homesteads or visiting the region), and could potentially constitute a high visual prominence, potentially resulting in a visual impact.

Seeing as Alternatives 1 and 2 are such slight deviations from the Preferred Alternative, the potential visual exposure of these lines fall within the viewshed of the Preferred Alternative. The following is therefore applicable to the Preferred Alternative, Alternative 1 and Alternative 2:

- The potential visual exposure of the infrastructure is contained to a core area on the site itself and within a 0.5 km radius thereof.

Observers travelling along the N1 and secondary roads, as well as, residents of Bakensklip, Hartebeesfontein and an unknown dwelling/homestead

- Potential visual exposure in the short to medium distance (i.e. between 0.5 and 1.5km), is concentrated throughout this radius with small pockets of visually screened areas to the east of the Umsinde substation and south west of the Khangela substation.

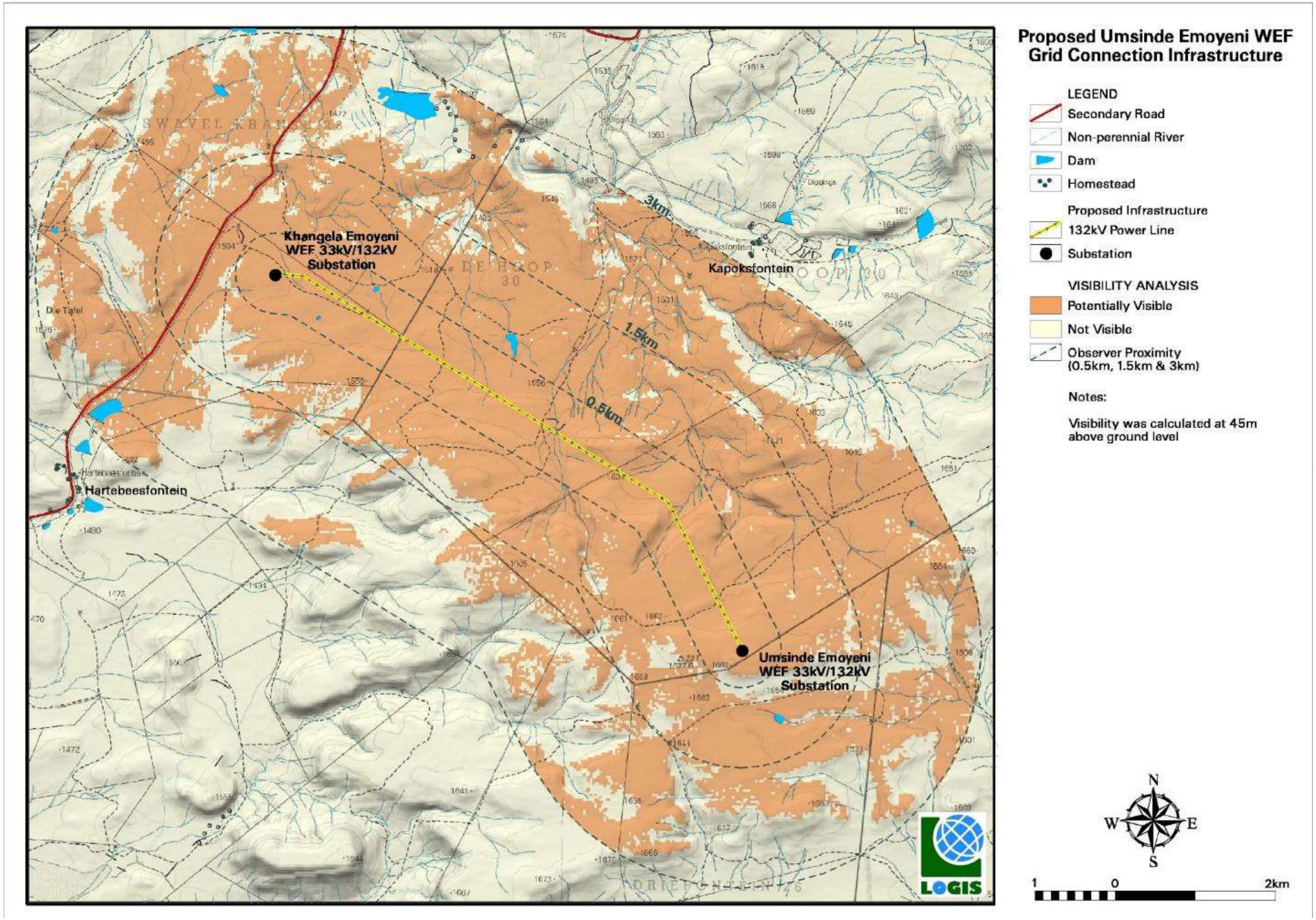
  Sensitive visual receptors include observers travelling along the N1 and secondary roads as well as residents of unknown dwelling/homesteads

- In the medium to long distance (i.e. between 1.5 and 3km offset), the extent of potential visual exposure is reduced largely owing to the hilly and mountainous topography. Visually screened areas are found to the south of the Umsinde substation, south east of the Khangela substation north and south of the centre of the line, west and north west of the Ishwati substation.

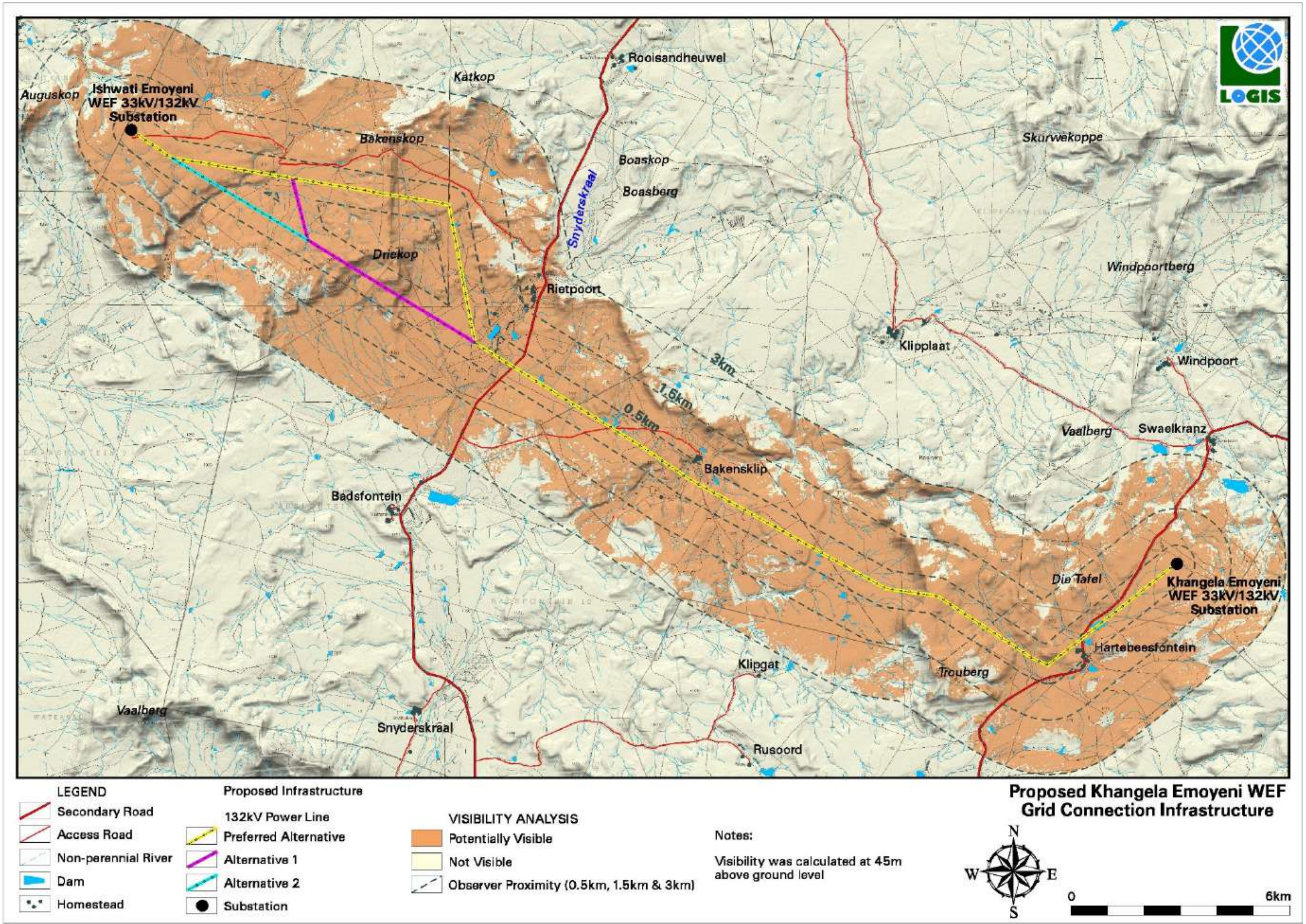
  Sensitive visual receptors include residents of Rietpoort, as well as observers travelling along the N1, R63 and secondary roads.

- Beyond the 3km offset from the proposed infrastructure, potential visual exposure becomes extremely scattered and very low. Sensitive visual receptors are not likely to be visually exposed to the proposed infrastructure, despite lying within the viewshed.

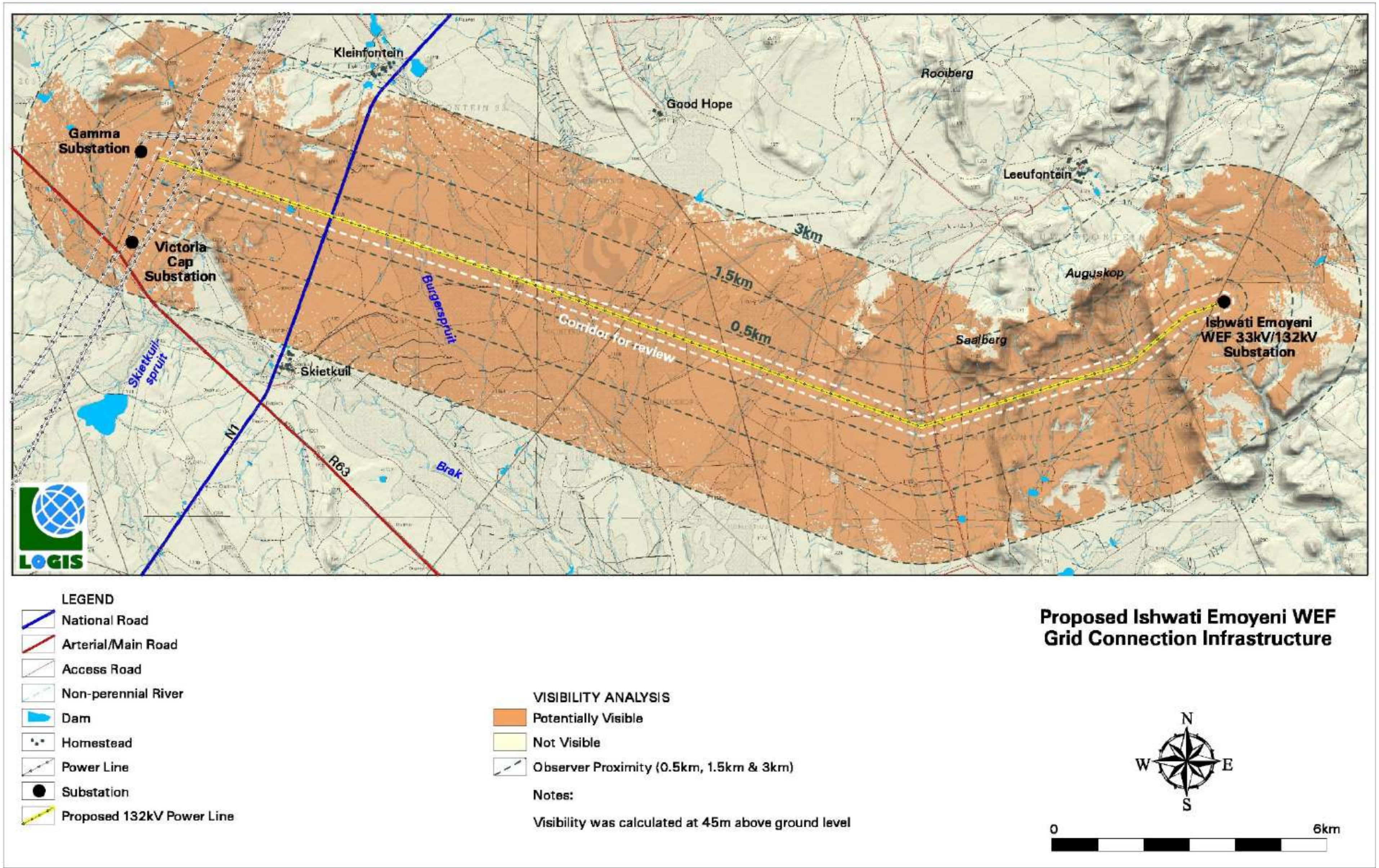
In general, as a result of the scattered and lower population density of the study area, the proposed New 132kv Grid Connection and Associated Infrastructure may constitute a visual prominence, potentially resulting in a moderate- low visual impact.



Map 10: Potential visual exposure for the proposed alignment- Umsinde to Khangela switching stations



Map 11: Potential visual exposure of the proposed alignment- Khangela to Ishwati switching stations



Map 12: Potential visual exposure of the proposed alignment- Ishwati to Gamma Substations

6.5 VISUAL IMPACT INDEX

The results of visual exposure, viewer incidence / perception and visual distance of the proposed facility are displayed on **Maps 13, 14 and 15**. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index. An area with short distance, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact when evaluating the issues related to the visual impact.

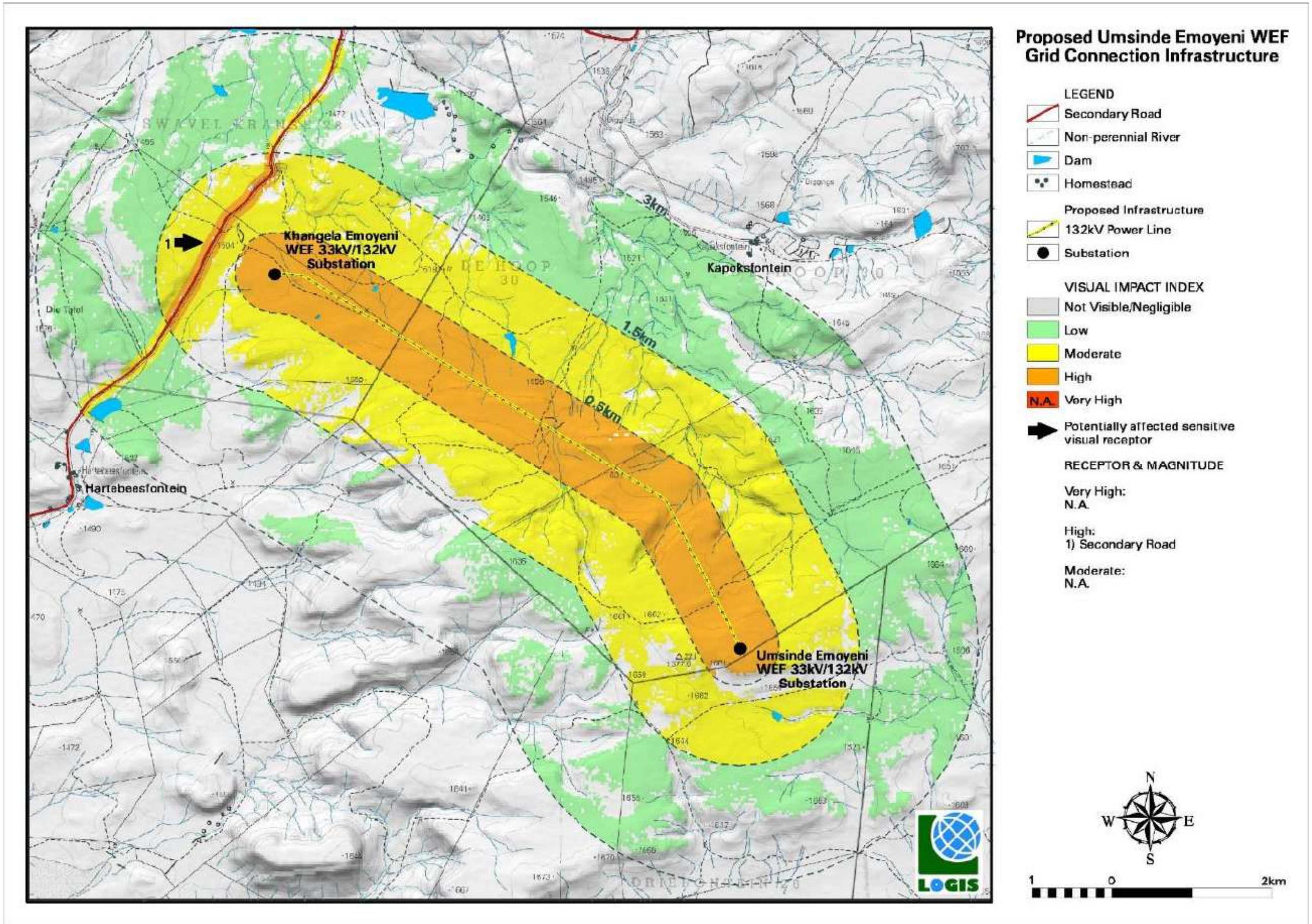
Seeing as Alternatives 1 and 2 are such slight deviations from the Preferred Alternative, the visual impact index of these lines fall within the viewshed of the Preferred Alternative. The following is therefore applicable to the Preferred Alternative, Alternative 1 and Alternative 2:

- The visual impact index map indicates a core zone of **high** visual impact within 0.5km of the proposed infrastructure. Users of a small section of the N1 and secondary roads, as well as, residents of Hartebeesfontein are likely to experience a **very high** visual impact.

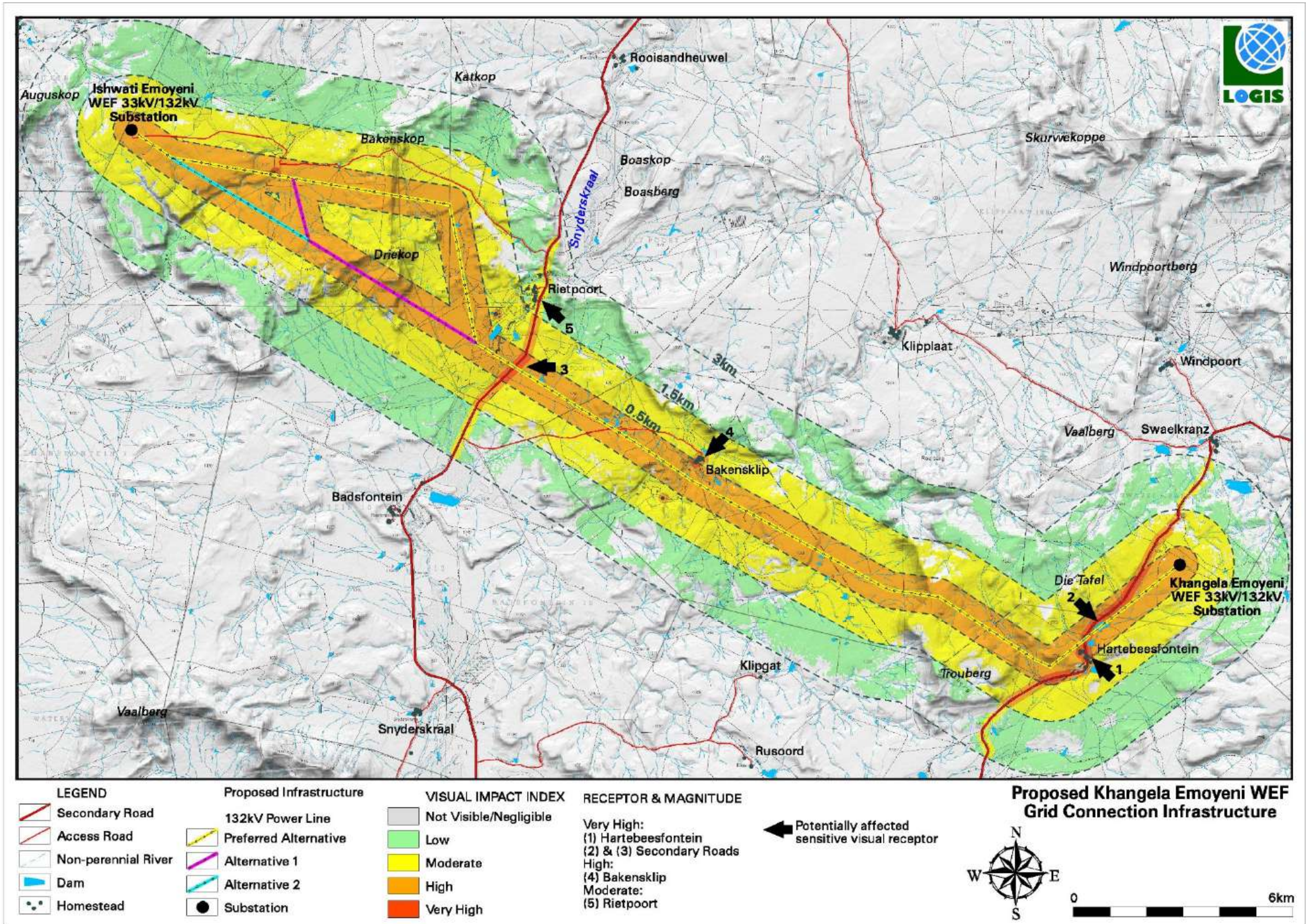
- Visual impact is predominantly **moderate** between 0.5km and 1.5km of the proposed infrastructure. The identified receptors between 0.5km and 1.5km of the proposed infrastructure, as listed below, are likely to experience **high** visual impact should no mitigation be undertaken. Sensitive visual receptors within this zone comprise mainly of the following:
    - Users traveling along a small portion of the N1 and secondary roads, it is expected that the visual intrusion where possible will be brief
    - Residents of Bakensklip.

- Visual impact is prominently **low** between 1.5 km and 3 km of the proposed infrastructure. The identified receptors between 1.5km and 3km of the proposed infrastructure, as listed below, are likely to experience **moderate** visual impact, should no mitigation be undertaken. Sensitive visual receptors within this zone comprise mainly of the following users:
    - Users traveling along small sections of the N1, R63 and secondary Roads, potential visibility is however scattered along the length of the roads and visual intrusion where possible will be brief
    - Residents of Rietpoort.

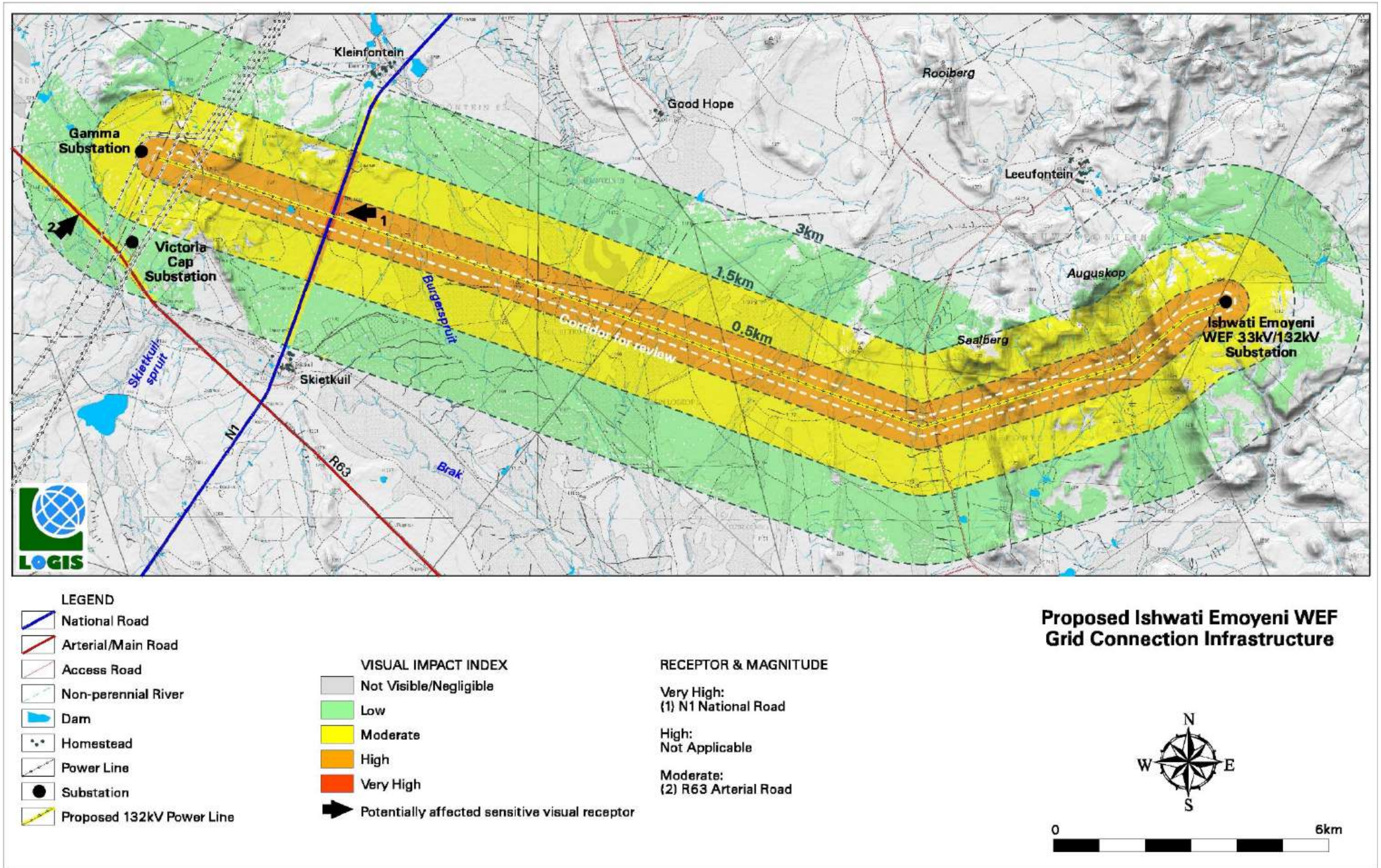
- Beyond the 3 km of the proposed infrastructure, the extent of potential visual impact is greatly reduced, and the magnitude is predominantly **very low** to negligible. It is not expected that sensitive receptors, if any, will be impacted visually by the proposed facility.



Map 13: Visibility index illustrating the frequency of exposure for the proposed grid connection and infrastructure- Umsinde to Khangela substations



Map 14: Visibility index illustrating the frequency of exposure for the proposed grid connection and infrastructure- Khangela to Ishwati substations



Map 15: Visibility index illustrating the frequency of exposure for the proposed grid connection and infrastructure- Ishwati to Gamma substations

7. VISUAL IMPACT ASSESSMENT

7.1 METHODOLOGY

The previous section of the report identified specific areas where likely visual impacts would occur. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues related to the visual impact.

The methodology for the assessment of potential visual impacts states the nature of the potential visual impact (e.g., the visual impact on users of major roads in the vicinity of the proposed infrastructure) and includes a table quantifying the potential visual impact according to the following criteria:

Extent - How far the visual impact is going to extend and to what extent it will have the highest impact. In the case of this type of development the extent of the visual impact is most likely to have a higher impact on receptors closer to the development and decrease as the distance increases.

- (1) Very low: Long distance > 3 Km
- (2) Low: Medium to long 1.5-3 Km
- (3) Medium: Short distance 0.5-1.5 Km
- (4) High: Very Short < 0.5 Km

Duration - The timeframe over which the effects of the impact will be felt.

- (1) Very short: 0-1 years
- (2) Short: 2-5 years
- (3) Medium: 5-15 years
- (4) Long: >15 years
- (5) Permanent

Magnitude - The severity or size of the impact. This value is read off the Visual Impact Index maps.

- (0) None
- (2) Minor
- (4) Low
- (6) Moderate
- (8) High
- (10) Very High

Probability - The likelihood of the impact actually occurring.

- (1) Very improbable: Less than 20% sure of the likelihood of an impact occurring
- (2) Improbable: 20-40% sure of the likelihood of an impact occurring
- (3) Probable: 40-60% sure of the likelihood of an impact occurring
- (4) Highly probable: 60-80% sure of the likelihood of that impact occurring
- (5) Definite: More than 80% sure of the likelihood of that impact occurring

Significance - The significance weighting for each potential visual impact (as calculated above) is as follows:

- (0-12) Negligible:
  Where the impact would have no direct influence on the decision to develop in the area. The impact would be of a very low order. In the case of negative impacts, almost no mitigation and or remedial activity would be needed, and any minor steps, which might be needed, would be easy, cheap, and simple.
- (13-30) Low:
  Where the impact would have a very limited direct influence on the decision to develop in the area. The impact would be of a low order and with little real effect. In the case of negative impacts, mitigation and / or remedial activity would be either easily achieved or little would be required, or both.
- (31-60) Moderate:
  Where the impact could influence the decision to develop in the area. The impact would be real but not substantial. In the case of negative impacts, mitigation and / or remedial activity would be both feasible and fairly easily possible.
- (61-80) High:

Where the impact must have an influence on the decision to develop in the area. The impacts are of a substantial order. In the case of negative impacts, mitigation and / or remedial activity would be feasible but difficult, expensive, time-consuming or some combination of these.

- (81-100) Very High:
  Where the impact will definitely have an influence on the decision to develop in the area. The impacts are of the highest order possible. In the case of negative impacts, there would be no possible mitigation and / or remedial activity possible.

The **significance** of the potential visual impact is equal to the **consequence** multiplied by the **probability** of the impact occurring, where the consequence is determined by the sum of the individual scores for magnitude, duration and extent (i.e., **significance = consequence (magnitude + duration + extent) x probability**).

Status – The perception of Interested and Affected Parties towards the proposed development.

- Positive
- Negative
- Neutral

Reversibility – The possibility of visual recovery of the impact following the decommissioning of the proposed development

- (1) Reversible
- (3) Recoverable
- (5) Irreversible

7.2 PRIMARY IMPACTS

7.2.1 POTENTIAL VISUAL IMPACT ON SENSITIVE VISUAL RECEPTORS IN CLOSE PROXIMITY TO THE PROPOSED INFRASTRUCTURE (i.e. all powerlines, all switching stations, access roads/tracks and watercourse crossings)

The visual impacts on sensitive visual receptors (i.e. residents of homesteads and users of secondary roads) in close proximity to the proposed infrastructure (i.e. within 0.5km) is expected to be of **high** significance for all alternatives.

A mitigating factor within this scenario is the very low occurrence of receptors within the receiving environment. Additionally, observers traveling along the secondary road will only be exposed to the visual intrusion for a short period of time. This reduces the probability of this impact occurring.

No mitigation is possible within this environment or for this type of infrastructure, but measures have been included as best practice guidelines. The table below illustrates this impact assessment.

Table 2: Impact table summarising the significance of sensitive visual receptors in close proximity to the proposed infrastructure

Nature of Impact: Potential visual impact on users of secondary roads and residents of Hartebeesfontein in close proximity to the proposed infrastructure						
	PREFERRED ALTERNATIVE		**ALTERNATIVE 1**		**ALTERNATIVE 2**	
	No mitigation	**Mitigation considered**	**No mitigation**	**Mitigation considered**	**No mitigation**	**Mitigation considered**
Extent	High (4)	High (4)	High (4)	High (4)	High (4)	High (4)
Duration	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)
Magnitude	Very High (10)	Very High (10)	Very High (10)	Very High (10)	Very High (10)	Very High (10)
Probability	Highly Probable (4)	Highly Probable (4)	Highly Probable (4)	Highly Probable (4)	Highly Probable (4)	Highly Probable (4)
Significance	***High (72)***	***High (72)***	***High (72)***	***High (72)***	***High (72)***	***High (72)***
Status (positive/negative)	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources	No	No	No	No	No	No
Can impacts be mitigated?	No		No		No	

Mitigation:

Planning:

- Respond to the natural environment during the planning of buildings and infrastructure.
- Consolidate development as far as possible and make use of already disturbed sites rather than pristine areas.
- Minimize disturbance to only that strictly required to enable the development, retain natural vegetation as far as possible and rehabilitate areas disturbed by the development
- Wherever possible, use materials, coatings, or paints that have little or no reflectivity.
- Commercial messages, symbols and/logos are not permitted on structures.

Construction:

- Ensure that vegetation is not unnecessarily 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., in already disturbed 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 using approved dust suppression techniques as and when required (i.e., whenever dust becomes apparent). ➢ Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts. ➢ Rehabilitate all disturbed areas immediately after the completion of construction works.
Cumulative impacts: The construction of the infrastructure will increase the cumulative visual impact of electrical type infrastructure within the region. This is specifically relevant in light of the existing power lines in the area and the existing Substations present in the study area.
Residual impacts: The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain.

7.2.2 POTENTIAL VISUAL IMPACT ON SENSITIVE VISUAL RECEPTORS WITHIN THE REGION

The visual impact on sensitive visual receptors (i.e. residents of homesteads and users of roads.) within the region (i.e., beyond the 0.5km offset) is expected to be of **moderate** significance for all proposed alternatives.

The low occurrence of visual receptors reduces the probability of this impact occurring.

No mitigation is possible within this environment and for a facility of this scale, but measures have been included as best practice guidelines. The table below illustrates this impact assessment.

Table 3: Impact table summarising the significance of visual impacts on sensitive receptors in the region

Nature of Impact: Potential visual impact on users of secondary roads and residents of homesteads on the periphery of the 0.5km offset and within the region beyond						
	PREFERRED ALTERNATIVE		**ALTERNATIVE 1**		**ALTERNATIVE 2**	
	No mitigation	**Mitigation considered**	**No mitigation**	**Mitigation considered**	**No mitigation**	**Mitigation considered**
Extent	Low (2)	Low (2)	Low (2)	Low (2)	Low (2)	Low (2)
Duration	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)
Magnitude	Moderate (6)	Moderate (6)	Moderate (6)	Moderate (6)	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)	Probable (3)	Probable (3)	Probable (3)	Probable (3)
Significance	***Moderate (36)***	***Moderate (36)***	***Moderate (36)***	***Moderate (36)***	***Moderate (36)***	***Moderate (36)***
Status (positive/negative)	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources	No	No	No	No	No	No
Can impacts be mitigated?	No		No		No	
Mitigation: Planning:						

➢ Respond to the natural environment during the planning of buildings and infrastructure. ➢ Consolidate development as far as possible and make use of already disturbed sites rather than pristine areas. ➢ Minimize disturbance to only that strictly required to enable the development, retain natural vegetation as far as possible and rehabilitate areas disturbed by the development ➢ Wherever possible, use materials, coatings, or paints that have little or no reflectivity. ➢ Commercial messages, symbols and/logos are not permitted on structures. Operations: ➢ Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint. ➢ Maintain the general appearance of the facility as a whole. ➢ Monitor rehabilitated areas, and implement remedial action as and when required. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.
Cumulative impacts: The construction of the infrastructure will increase the cumulative visual impact of electrical type infrastructure within the region. This is specifically relevant in light of the existing power lines in the area and the existing Substations present in the study area.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

7.2.3 POTENTIAL VISUAL IMPACT OF ASSOCIATED INFRASTRUCTURE ON SENSITIVE VISUAL RECEPTORS IN CLOSE PROXIMITY

The height of the proposed new collector substations (switching stations) will not exceed two storeys (i.e. 6m), therefore the visual exposure of this component will fall within the view sheds generated for the power line infrastructure (which is not expected to exceed 45m). Other associated infrastructure would include access roads and cleared servitudes along the alignments.

Servitudes will need to be maintained along the length of the proposed power lines for their entire operational life and access roads will be required both to construct the power lines, and to maintain the servitudes (operational phase). These servitudes and access roads have the potential of manifesting as landscape scarring, and thus represent a potential visual impact within the viewshed areas. This is especially relevant for steep slopes where erosion could occur over time. Such erosion and landscape scarring could represent a visual impact.

As access roads and servitudes have no elevation or height, the visual impact of this associated infrastructure will be absorbed by the visual impact of the primary infrastructure.

The potential visual impact of the associated infrastructure on sensitive visual receptors in close proximity thereto is expected to be of **moderate** significance pre mitigation and may be mitigated to **low** post mitigation**.** The table illustrates the assessment of this anticipated impact.

A mitigating factor within this scenario is the very low occurrence of receptors within the receiving environment and in close proximity to the proposed substations. This reduces the probability of this impact occurring.

Table 4: Impact table summarising the significance of the visual impacts of associated infrastructure on sensitive receptors in close proximity

Nature of Impact: Potential visual impact of the associated infrastructure located on site on residents of farm and homesteads and users of the secondary road within close proximity to the proposed facility (within the 0.5 Km offset)						
	PREFERRED ALTERNATIVE		**ALTERNATIVE 1**		**ALTERNATIVE 2**	
	No mitigation	**Mitigation considered**	**No mitigation**	**Mitigation considered**	**No mitigation**	**Mitigation considered**
Extent	High (4)	High (4)	High (4)	High (4)	High (4)	High (4)
Duration	Long Term (4)	Long (4)	Long Term (4)	Long (4)	Long Term (4)	Long (4)
Magnitude	Very high (10)	Moderate (6)	Very high (10)	Moderate (6)	Very high (10)	Moderate (6)
Probability	Probable (3)	Improbable (2)	Probable (3)	Improbable (2)	Probable (3)	Improbable (2)
Significance	***Moderate (54)***	**Low (28)**	***Moderate (54)***	**Low (28)**	***Moderate (54)***	**Low (28)**
Status (positive/negative)	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources	No	No	No	No	No	No
Can impacts be mitigated?	Yes		Yes		Yes	

Mitigation:

<u>Site development & Operation:</u>

- To the extent possible, implement measures to avoid or minimise disturbance to large trees, natural features and noteworthy natural vegetation in all areas outside of the activity footprint.
- Consolidate development as far as possible and make use of already disturbed sites rather than pristine areas.
- Minimize disturbance to only that strictly required to enable the development, retain natural vegetation as far as possible and rehabilitate areas disturbed by the development
- Plan ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. Consolidate existing infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible.
- Use existing roads wherever possible. Where new roads are required these should be planned carefully, taking due cognisance of the local topography. All efforts should be employed to try and align roads along the landscape contours wherever possible. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.
- Keeping infrastructure at minimum heights.
- Introducing landscaping measures such as vegetating berms.
- Avoid the use of highly reflective material.
- Maintain the general appearance of the site as a whole.

<u>Lighting</u>

- Lighting should be kept to a minimum wherever possible.
- Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the activity – this is especially relevant where the edge of the activity is exposed to residential properties.
- Wherever possible, lights should be directed downwards to avoid illuminating the sky.
- Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on movement.

<u>Construction:</u>

- Rehabilitate all construction areas, when no longer required.
- Keep vegetation clearing to a minimum.

<u>Operations:</u>

- Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint as far as possible.
- Maintain the general appearance of the facility as a whole.

➢ Monitor rehabilitated areas, and implement remedial action as and when required. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas as per the rehabilitation plan undertaken. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions as required.
Cumulative impacts: The construction of the infrastructure will increase the cumulative visual impact of electrical type infrastructure within the region. This is specifically relevant in light of the existing power lines in the area and the existing Substations present in the study area.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

7.2.4 POTENTIAL VISUAL IMPACT OF CONSTRUCTION ON SENSITIVE VISUAL RECEPTORS IN CLOSE PROXIMITY TO THE PROPOSED INFRASTRUCTURE (i.e. all powerlines, switching stations, access roads and watercourse crossings)

During the construction period, there will be an increase in heavy vehicles utilising the roads to the construction sites that may cause, at the very least, a visual nuisance to other road users and landowners in the area in close proximity. Mitigation entails proper planning, management and rehabilitation of all construction sites to forego visual impacts.

A mitigating factor within this scenario is the very low occurrence of receptors within the receiving environment. Additionally, observers traveling along the secondary road will only be exposed to the visual intrusion for a short period of time. This reduces the probability of this impact occurring.

The table below illustrates the assessment of the anticipated visual impact of construction on sensitive visual receptors in close proximity to the proposed infrastructure. Visual impacts are likely to be of **moderate** significance for all proposed lines and may be mitigated to **low.**

Table 5: Impact table summarizing the significance of visual impacts of construction on visual receptors in close proximity

Nature of Impact: Visual impact of construction on sensitive visual receptors in close proximity to the proposed infrastructure						
	PREFERRED ALTERNATIVE		**ALTERNATIVE 1**		**ALTERNATIVE 2**	
	No mitigation	**Mitigation considered**	**No mitigation**	**Mitigation considered**	**No mitigation**	**Mitigation considered**
Extent	High (4)	High (4)	High (4)	High (4)	High (4)	High (4)
Duration	Short Term (1)	Short Term (1)	Short Term (1)	Short Term (1)	Short Term (1)	Short Term (1)
Magnitude	Very high (10)	Low (4)	Very high (10)	Low (4)	Very high (10)	Low (4)
Probability	Probable (3)	Improbable (2)	Probable (3)	Improbable (2)	Probable (3)	Improbable (2)
Significance	***Moderate (45)***	**Low (18)**	***Moderate (54)***	**Low (18)**	***Moderate (54)***	**Low (18)**
Status (positive/negative)	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources	No	No	No	No	No	No
Can impacts be mitigated?	Yes		Yes		Yes	

Mitigation: Lighting ➢ Lighting should be kept to a minimum wherever possible. ➢ Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the activity – this is especially relevant where the edge of the activity is exposed to residential properties. ➢ Wherever possible, lights should be directed downwards to avoid illuminating the sky. ➢ Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on movement. Construction: ➢ Keep vegetation removal to a minimum where possible. ➢ If possible keep the construction period to a minimum. ➢ Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed 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 and then disposed regularly at licensed waste facilities. ➢ Employ dust suppression techniques as and when required (i.e. whenever dust becomes apparent). ➢ Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts. ➢ Rehabilitate all disturbed areas as per the rehabilitation plan and schedule. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas as per the rehabilitation plan undertaken. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions as required.
Cumulative impacts: N/A
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

7.2.5 POTENTIAL VISUAL IMPACT OF LIGHTING AT NIGHT ON SENSITIVE VISUAL RECEPTORS IN THE REGION

It can be expected that the light trespass and glare from the security and after-hours operational lighting (flood lights) for the proposed new substations will have some significance on the receiving environment.

The potential lighting impact is known as sky glow. Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the number of light sources. Each new light source, especially upwardly directed lighting, contributes to the increase in sky glow. The general lighting of the collector substation may contribute to the effect of sky glow in an otherwise dark environment.

The visual impacts as a result of lighting at night on sensitive visual receptors in the region is likely to be of **moderate** significance and may be mitigated to **low**. Best practice guidelines for general site lighting that may occur on the site has been taken into consideration. The table below illustrates this impact assessment.

The number of farmsteads and settlements exposed to visual impact influences the probability rating.

Table 6: Impact table summarizing the significance of operational lighting at night on visual receptors within the region

Nature of Impact: Visual impact of lighting at night on sensitive visual receptors in close proximity to the proposed facility						
	PREFERRED ALTERNATIVE		**ALTERNATIVE 1**		**ALTERNATIVE 2**	
	No mitigation	**Mitigation considered**	**No mitigation**	**Mitigation considered**	**No mitigation**	**Mitigation considered**
Extent	High (4)	High (4)	High (4)	High (4)	High (4)	High (4)
Duration	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)
Magnitude	High (8)	Low (4)	High (8)	Low (4)	High (8)	Low (4)
Probability	Probable (3)	Improbable (2)	Probable (3)	Improbable (2)	Probable (3)	Improbable (2)
Significance	***Moderate (48)***	**Low (24)**	***Moderate (48)***	**Low (24)**	***Moderate (48)***	**Low (24)**
Status (positive/negative)	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources	No	No	No	No	No	No
Can impacts be mitigated?	Yes		Yes		Yes	

Mitigation:

Planning & operation:

- Shield the sources of light by physical barriers (walls, vegetation, or the structure/light fitting itself) to the extent possible.
- Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights.
- Make use of minimum lumen or wattage in fixtures.
- Make use of down-lighters, or shielded fixtures.
- Make use of Low-Pressure Sodium lighting or other types of low impact lighting.
- Where possible, make 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.

Cumulative impacts:

The light generated at night locally is minimal. The impact of the proposed substations infrastructure although in line with current development and land use trends in the region, will certainly will contribute to a regional increase in lighting impact.

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

7.3 SECONDARY IMPACTS

7.3.1 POTENTIAL VISUAL IMPACT ON THE VISUAL CHARACTER OF THE LANDSCAPE AND SENSE OF PLACE OF THE REGION

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria and specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.) play a significant role.

A visual impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

In general, the landscape character of the greater study area and site itself presents as undeveloped and largely natural in character. The visual quality of the region is generally high by virtue of the vast and undeveloped nature of the environment. This lends a distinct sense of place to the area, but the landscape is not unique. As such, the entire study area is considered sensitive to visual impacts due to its generally low levels of transformation.

The anticipated visual impact on the visual character and sense of place of the study area is expected to be of **moderate** significance. The low occurrence of visual receptors and the remote location of the study area relative to tourism areas reduces the probability of this impact occurring. Additionally, the presence of existing electrical infrastructure within the region reduces the probability of this impact occurring.

No mitigation is possible within this environment and for a facility of this scale, but measures have been included as best practice guidelines. The table below illustrates this impact assessment.

Table 7: Impact table summarizing the significance of visual impacts on landscape character and sense of place within the region

Nature of Impact: Visual impact of the proposed development on the visual quality of the landscape and sense of place of the region						
	PREFERRED ALTERNATIVE		**ALTERNATIVE 1**		**ALTERNATIVE 2**	
	No mitigation	**Mitigation considered**	**No mitigation**	**Mitigation considered**	**No mitigation**	**Mitigation considered**
Extent	Low (2)	Low (2)	Low (2)	Low (2)	Low (2)	Low (2)
Duration	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)
Magnitude	High (8)	High (8)	High (8)	High (8)	High (8)	High (8)
Probability	Probable (3)	Probable (3)	Probable (3)	Probable (3)	Probable (3)	Probable (3)
Significance	***Moderate (42)***	***Moderate (42)***	***Moderate (42)***	***Moderate (42)***	***Moderate (42)***	***Moderate (42)***
Status (positive/negative)	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources	No	No	No	No	No	No
Can impacts be mitigated?	No		No		No	

Mitigation:

Planning:

- Respond to the natural environment during the planning of buildings and infrastructure.
- Consolidate development and make use of already disturbed sites rather than pristine areas.
- Restrict vegetation clearing/disturbance to the minimum strictly required to enable the development.
- Visually break up large bulky buildings into smaller, subtler, less prominent shapes and planes.
- Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint as far as possible.
- Plan ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised.
- Use existing roads wherever possible. Where new roads are required to be constructed, these should be planned carefully, taking due cognisance of the local topography. Roads should be laid out along the contour wherever possible, and should never traverse slopes at 90 degrees. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.
- Wherever possible, use materials, coatings, or paints that have little or no reflectivity.
- Commercial messages, symbols and/logos are not permitted on structures.

Construction:

➢ Rehabilitate all construction areas. ➢ Ensure that vegetation is not cleared unnecessarily to make way for infrastructure. Operations: ➢ Maintain the general appearance of the facility as a whole. ➢ Monitor rehabilitated areas, and implement remedial action as and when required. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.
Cumulative impacts: The construction of the infrastructure will increase the cumulative visual impact of electrical type infrastructure within the region. This is specifically relevant in light of the existing power lines in the area and the existing Substations present in the study area.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

7.3.2 POTENTIAL CUMULATIVE VISUAL IMPACT WITHIN THE REGION

There are already existing high voltage power lines that traverse the study area from south to north and feed into the existing substations. The addition of the proposed new grid connection and associated infrastructure will result in an increase in this type of infrastructure within the region and could result in a cumulative visual impact.

The table below illustrates the assessment of the anticipated cumulative visual impact of infrastructure on sensitive visual receptors within the region. Visual impacts are likely to be of **moderate** significance with no mitigation possible.

Table 8: Impact table summarizing the potential cumulative visual impact on sensitive visual receptors within the region

Nature of Impact: Potential cumulative visual impact of infrastructure on visual receptors within the region						
	PREFERRED ALTERNATIVE		**ALTERNATIVE 1**		**ALTERNATIVE 2**	
	No mitigation	**Mitigation considered**	**No mitigation**	**Mitigation considered**	**No mitigation**	**Mitigation considered**
Extent	Low (2)	Low (2)	Low (2)	Low (2)	Low (2)	Low (2)
Duration	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)	Long Term (4)
Magnitude	Moderate (6)	Moderate (6)	Moderate (6)	Moderate (6)	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)	Probable (3)	Probable (3)	Probable (3)	Probable (3)
Significance	***Moderate (36)***	***Moderate (36)***	***Moderate (36)***	***Moderate (36)***	***Moderate (36)***	***Moderate (36)***
Status (positive/negative)	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources	No	No	No	No	No	No
Can impacts be mitigated?	No		No		No	
Mitigation:						

Planning:

- Respond to the natural environment during the planning of buildings and infrastructure.
- Consolidate development and make use of already disturbed sites rather than pristine areas.
- Minimize disturbance to only that strictly required to enable the development, retain natural vegetation as far as possible and rehabilitate areas disturbed by the development
- Visually break up large bulky buildings into smaller, subtler, less prominent shapes and planes.
- Plan ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised.
- Use existing roads wherever possible. Where new roads are required to be constructed, these should be planned carefully, taking due cognisance of the local topography. Roads should be laid out along the contour wherever possible, and should never traverse slopes at 90 degrees. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.
- Wherever possible, use materials, coatings, or paints that have little or no reflectivity.
- Commercial messages, symbols and/logos are not permitted on structures.

Construction:

- Rehabilitate all construction areas.
- Ensure that vegetation is not cleared unnecessarily to make way for infrastructure.

Operations:

- Maintain the general appearance of the facility as a whole.
- Monitor rehabilitated areas, and implement remedial action as and when required.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

7.4 THE POTENTIAL TO MITIGATE VISUAL IMPACTS

The primary visual impact, namely the presence of the proposed New 132kv Grid Connection And Associated Infrastructure is not possible to mitigate. The following is however recommended:

- Minimize disturbance to only that strictly required to enable the development, retain natural vegetation as far as possible and rehabilitate areas disturbed by the development
- Plan ancillary infrastructure (i.e. substations and roads) in such a way and in such a location that clearing of vegetation is minimised. Consolidate existing infrastructure as much as possible and make use of already disturbed areas rather than pristine sites wherever possible.
- Use existing roads wherever possible. Where new roads are required to be constructed, these should be planned carefully, taking due cognisance of the local topography. Roads should be laid out along the contour wherever possible and should never traverse slopes at 90 degrees. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.
- Access roads, which are not required post-construction, should be ripped and rehabilitated.

- Mitigation of visual impacts associated with the construction phase, albeit temporary, entails proper planning, management and rehabilitation of all construction sites. Construction should be managed according to the following principles:

  - 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 any potential temporary construction camps along the corridor in order to minimise vegetation clearing.
  - 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 (i.e., whenever dust becomes apparent).
  - Restrict construction activities to daylight hours as far as possible in order to negate or reduce the visual impacts associated with lighting.
  - Ensure that all infrastructure and the site and general surrounds are maintained and kept neat.
  - Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.
  - Monitor all rehabilitated areas for at least a year for rehabilitation failure and implement remedial action as required. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.

- Mitigation of other lighting impacts includes the pro-active design, planning and specification lighting for the substations. The correct specification and placement of lighting and light fixtures will go far to contain rather than spread the light. Additional measures include the following:

  - Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself).
  - Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
  - Making use of minimum lumen or wattage in fixtures.
  - Making use of down-lighters, or shielded fixtures.
  - Making use of Low-Pressure Sodium lighting or other types of low impact lighting.
  - 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.

- During Operations, monitor the general appearance of the facility as a whole, as well as, all rehabilitated areas.
  - The maintenance of the buildings and ancillary structures and infrastructure will ensure that the facility does not degrade, thus aggravating visual impact. Implement remedial action where required.

  - Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required.
- Secondary impacts anticipated as a result of the proposed infrastructure (i.e., impacts on landscape character and sense of place) are not possible to mitigate.

- After decommissioning, all infrastructure should be removed and all disturbed areas appropriately rehabilitated. Monitor rehabilitated areas post-decommissioning and implement remedial actions and consult an ecologist regarding rehabilitation specifications if necessary.

The possible mitigation of both primary and secondary visual impacts as listed above should be implemented and maintained on an on-going basis.

8. SUMMARY OF VISUAL IMPACTS ASSESSED

In light of the results and findings of the Visual Impact Assessment undertaken for the proposed New 132kv Grid Connection and Associated Infrastructure, it is acknowledged that the receiving environment will be visually transformed for the entire operational lifespan of the facility.

The following is a summary of the impacts assessed:

- The potential visual impact of the facility on sensitive visual receptors within 0.5km (residents of homesteads/dwellings and users of the secondary roads), in close proximity to the proposed facility is likely to be **high.**
- The possible visual impact of the facility on the residents homesteads and users of secondary road on the periphery of the 0.5km offset and within the region beyond is likely to be of **moderate** significance.
- The potential visual impact of the associated infrastructure on residents of homesteads/dwellings and users of the secondary road within close proximity of the proposed facility is likely to be of **moderate** significance and may be mitigated to **low** should the possible best practice mitigation measures be implemented.
- The potential visual impact of construction on sensitive visual receptors in close proximity to the facility is likely to be of **moderate** significance before mitigation and **low** post mitigation.
- The anticipated visual impact of operational lighting at night on sensitive visual receptors within the study area is likely to be of **moderate** significance and may be mitigated to **low** should the possible best practice mitigation measures be implemented.
- The potential visual impact of the proposed development on the visual quality of the landscape and sense of place of the region is likely to be of **moderate** significance both before and after mitigation.
- The potential cumulative visual impact on sensitive visual receptors within the region is likely to be of **moderate** significance.

9. CONCLUSION AND RECOMMENDATIONS

The proposed project entails the development of 132 kV overhead powerlines, three (3) 132 kV on-site substations (switching stations), new access tracks and watercourse crossing points associated with the Emoyeni Wind Energy Facilities. All said infrastructure will be located within a 400m wide assessment corridor (and expanded corridor in the vicinity of the Gamma MTS as described above). It should be noted that visual assessment has been undertaken for the assessment corridor as a whole, whereby all findings are applicable and allow for micro-siting anywhere within this assessed corridor.

The visual assessment of the proposed New 132kv Grid Connection and Associated Infrastructure within the 400m assessment corridor indicates that the construction and operation of the proposed infrastructure will have a visual effect on both the rural landscape and on sensitive receptors in the study area.

The proposed infrastructure will be visible within an area that is generally characterised by low growing shrubland and wide-open undeveloped spaces. The infrastructure would thus be highly visible and impossible to hide within an area that incorporates potentially various sensitive visual receptors that may consider visual exposure to this type of infrastructure to be intrusive.

The low occurrence of such sensitive visual receptors within this environment, specifically in close proximity to the proposed infrastructure as well as the presence of existing high voltage overhead powerlines, is of relevance however, and has affected the significance rating of the anticipated visual impacts.

Overall, the post mitigation significance of the visual impacts for all the alternatives is predominately **moderate** to **low.** A **high** significance rating is anticipated for users travelling along the secondary roads and residents of dwellings within 0.5 km from the proposed infrastructure. However, due to the low number/ density of homesteads/dwellings within the study area and the fact that observers travelling along the secondary road will only experience a visual intrusion for a short period of time, this impact is anticipated to be greatly reduced.

Notwithstanding the above, there are not many options as to the mitigation of the visual impact of the proposed infrastructure. No amount of vegetation screening or landscaping would be able to hide structures of these dimensions, especially within this receiving environment.

In order to ensure that all the spatial analyses and mapping undertaken in this report is as accurate as possible, a transparent and scientifically defensible approach in line with best practice methodology for this type of assessment, has been utilised. The objective of this process is to quantify the potential visual impacts associated with the proposed New 132kv Grid Connection and Associated Infrastructure, using visibility analyses, proximity analyses and the identification of sensitive receptors. However, it must be noted that visual impact is a very subjective concept, personal to each individuals' backgrounds, opinions and perceptions. The subjects in this case are the identified sensitive receptors such as the residents of homesteads/dwellings and users of roads.

According to the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for Involving Visual and Aesthetic Specialists in the EIA Process (Oberholzer, 2005), the criteria that determine whether or not a visual impact constitutes a potential fatal flaw are categorised as follows:

1. Non-compliance with Acts, Ordinances, By-laws and adopted policies relating to visual pollution, scenic routes, special areas or proclaimed heritage sites.
2. Non-compliance with conditions of existing Records of Decision.
3. Impacts that may be evaluated to be of high significance and that are considered by the majority of the stakeholders and decision-makers to be unacceptable.

In terms of the above and to the knowledge of the author, the proposed development is compliant with all Acts, Ordinances, By-laws and adopted policies relating to visual pollution, scenic routes, special areas or proclaimed heritage sites, as well as, conditions of existing Records of Decisions and only one impact of high significance have been evaluated post mitigation though it is not deemed to be unacceptable due to the nature of the project.

This assessment has adopted a risk averse approach by assuming that the perception of most (if not all) of the sensitive visual receptors (bar the landowners of the properties earmarked for the development), would be predominantly negative towards the proposed New 132kv Grid Connection and Associated Infrastructure in the region. While still keeping in mind that there are also likely to be supporters of the facility (as a possible employer and income generator in the region) amongst the population of the larger region, but they are largely expected to be indifferent to the construction of the facility and not as vocal in their support for the facility as the detractors thereof.

Therefore, with the information available to the specialist at the time of writing this report, it cannot be empirically determined that the statistical majority of objecting stakeholders were exceeded. If evidence to the contrary surfaces during the progression of the development application, the specialist reserves the right to revise the statement below.

Therefore, in the likelihood that the proposed development will be met with concern and objections from some of the affected sensitive receptors in the region, this report cannot categorically state that any of the above conditions were transgressed. As such these visual impacts are not considered to be fatal flaws for a development of this nature particularly due to the remote location of the study area and very low density of visual receptors. While all three (3) of the alternatives have been found to have a similar impact and therefore considered acceptable, it is recommended that the Preferred Alternative for the proposed development of 132 kV overhead powerlines, three (3) 132 kV on-site substations (switching stations), new access tracks and watercourse crossing points associated with the authorized Umsinde Emoyeni and Khangela Emoyeni Wind Energy Facilities, as per the assessed layout (i.e. placement anywhere within the assessment corridor) be supported from a visual perspective, subject to the implementation of the suggested best practice mitigation measures provided in this report.

10. REFERENCES

DEADP, Provincial Government of the Western Cape, 2011. Guideline on Generic Terms of Reference for EAPS and Project Schedules.

Oberholzer, B. (2005). Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1.

NuLeaf PLANNING & ENVIRONMENTAL integrated sustainable solutions

APPENDIX 3: SITE SENSITIVITY VERIFICATION

CONTENTS

1. INTRODUCTION

The applicant, Eskom Holdings SOC Limited is proposing the establishment of the 132kV grid connection infrastructure (overhead powerline and x3 on-site switching stations), associated access tracks & watercourse crossings associated with the authorised Emoyeni Wind Energy Facilities located in the Beaufort West & Ubuntu Local Municipalities, Northern and Western Cape Provinces.

The following Environmental Authorisations for various grid connection infrastructure and wind energy facilities related to the Emoyeni Wind Energy Facilities and their authorised grid connection infrastructure were previously obtained:

Umsinde Emoyeni Wind Energy Facility	DFFE Ref: 14/12/16/3/3/2/686 on 06 September 2018
132kV Grid connection Infrastructure associated with the Umsinde Emoyeni WEF	DFFE Ref: 14/12/16/3/3/2/684 on 06 September 2018
Khangela Emoyeni Wind Energy Facility	DFFE REF:. 14/12/16/3/3/2/687 on the 06 September 2018
132kV Grid connection Infrastructure associated with the Khangela Emoyeni WEF	DFFE REF:. 14/12/16/3/3/2/685 on 06 September 2018
Ishwati Emoyeni Wind Energy Facility	DFFE Ref: 12/12/20/2351 on 2 July 2015
Transmission grid connection infrastructure (Eskom Gamma Main Transmission Substation)	DFFE Ref: 14/12/16/3/3/2/410 on 02 July 2015
Distribution grid connection infrastructure (Eskom distribution grid connection infrastructure consisting of 132kV power lines and on-site switching station located within the authorised Ishwati Emoyeni Wind Energy Facility)	DFFE Ref: 14/12/16/3/3/2/411 on 02 July 2015

Following receipt of the relevant Environmental Authorisations for the grid connection infrastructure for the Umsinde and Khangela Emoyeni Wind Energy Facilities (DFFE Ref:14/12/16/3/3/2/684 and DFFE Ref:.14/12/16/3/3/2/685) , it was noted that several listed activities that were relevant to the grid infrastructure had not been considered , therefore new a Basic

Peter Velcich PrLArch ML(Pret) Cell:+27 82 442 0220 peter@nuleafsa.co.za
8a Trevor Street, Murrayfield, 0184 Tel: +27 12 753 5792 Fax: +27 86 5716292
www.nuleafsa.co.za

Assessment process will be undertaken that will now consider all the applicable listed activities as per the EIA Regulations. In addition, due to alterations in the wind farm layouts, and based on further technical analysis and liaison with Eskom's technical and grid access units it was determined that the previously authorised powerline routings intended to evacuate electricity generated from these authorised wind energy facilities to the National Grid via the

Gamma Substation are no longer suitable/ optimal and will need to be revised to cater for final wind farm layouts, and Eskom's connection requirements. A new Basic Assessment will therefore be undertaken to assess the revised (re-optimised) grid connection layout as well all applicable listed activities, including the listed activities omitted from the original BA process. The proposed 400m wide development corridor that has been identified for the development of the grid connection infrastructure required to evacuate power generated from the authorised Emoyeni WEFs, is informed by the most feasible grid connection point into the national grid from a technical, economic and environmental perspective.

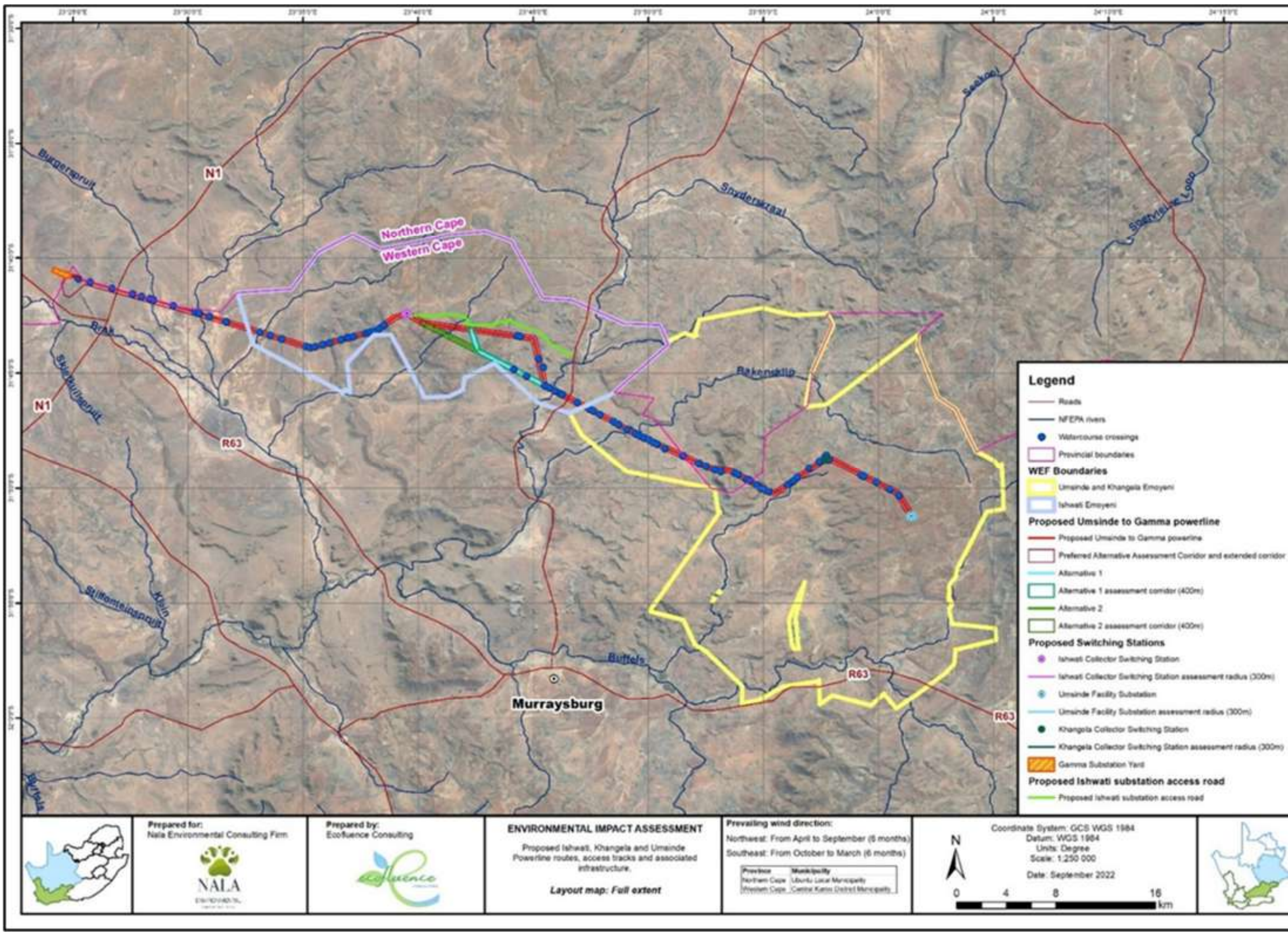


Figure 1. Proposed Layout map for the proposed development corridor and associated infrastructure related to the Emoyeni Wind Energy Facilities

Since the Umsinde Emoyeni and Khangela Emoyeni Wind Energy Facilities have been selected as preferred bidder projects by private offtakers and based on further technical analysis and liaison with Eskom's technical and grid access units it was determined that the previously authorised powerline routings intended to evacuate electricity generated from these authorised wind energy facilities to the National Grid via the Gamma Substation are no longer suitable/ optimal and will need to be revised to cater for final wind farm layouts, and Eskom's connection requirements. Therefore, new grid connection infrastructure is proposed that is in line with Eskom's technical and feasibility requirements. The following Infrastructure has been assessed:

- The establishment of a 132kV collector substation (switching station) within the authorised Umsinde Emoyeni WEF site (adjacent to the WEF facility substation) with a footprint of approximately 100m X 80m (~0.8ha) to be located within an assessment footprint that encompasses a 300m radius.
- The establishment of a 132kV collector substation (switching station) within the authorised Khangela Emoyeni WEF site (adjacent to the WEF facility substation) with a footprint of approximately 100m X 80m (~0.8ha) to be located within an assessment footprint that encompasses a 300m radius.

- The establishment of a 132kV collector substation (switching station) within the authorised Ishwati Emoyeni WEF site (adjacent to the WEF facility substation) with a footprint of approximately 120m X 100m (~1.2 ha) with an assessment footprint that encompasses a 300m radius.

- The establishment of a 132kV powerline within a 400m wide corridor that will extend from the Khangela switching station to the Ishwati switching station (~36km), and then onward for ~25km to the Eskom Gamma Substation. In addition, a further length of 132kV powerline (within a 400m wide corridor) will extend from the Umsinde switching station to the Khangela switching station for ~8km OR it may connect directly into the Khangela-Ishwati powerline at the Khangela switching station. An extended powerline development corridor of approximately 1.91 km^2 has been assessed in the vicinity of the Gamma Substation, that will enable the 132kV powerline to connect to either the south face of the Gamma Substation yard or approach from the east, depending on the available connection point at the time of connection. The 132kV Powerline from Umsinde to Khangela, and from Khangela to Ishwati and onward to Gamma Substation will be a single- or double-circuit overhead powerline, with a single set of pylons structures with a maximum height of 35m Access/service tracks (jeep track) up to 7m wide and associated watercourse crossings will be associated with the powerline, and will be located within the assessed powerline corridor.

- The establishment of a new access road approximately 14km long from the existing public road from Richmond to the Ishwati switching station site. The proposed new access road will be unsealed and up to 12m wide during construction , but will be reduced to a maximum of 6 m width during operation. The access road will largely follow an existing farm road (to be upgraded), but will also entail development of a new length of road.

The proposed grid infrastructure along with the access roads and water crossings are located within the authorised Umsinde, Khangela and Ishwati Wind Energy Facilities northeast of the town of Murraysburg. The authorised Umsinde Emoyeni WEF (DFFE REF: :.14/12/16/3/3/2/686), Khangela Emoyeni Wind Energy Facility (DEA REF:. 14/12/16/3/3/2/687) and the Ishwati Emoyeni Wind Energy Facility (DFFE REF: DFFE Ref: 12/12/20/2351) sites are located within the Beaufort West Renewable Energy Development Zone (REDZ) and the majority of the new proposed grid connection infrastructure falls within the REDZ and the Central Corridor of the Strategic Transmission Corridors.

Table 1.1: Location of proposed new development corridor housing the 132kV grid connection infrastructure, access tracks and watercourse crossings:

Province	Northern and Western Cape Province
Local Municipality	Beaufort West and Ubuntu Local Municipality
District Municipality	Central Karoo and Pixley ka Seme District Municipality
Nearest Town	Murraysburg
Ward No.	Ward 1 (BWLM), Ward 3 (ULM)
Details of properties affected	• Portion 1 of farm Klein Driefontein No. 152

	• Remainder of Farm De Hoop No. 30; • Portion 2 of Farm De Hoop No. 30 • Remainder of Farm Swavel Kranse No. 28 • Portion 2 of Farm Swavel Kranse No. 28 • Portion 4 (portion of portion 1) of Farm Driefontein 26 • Portion 6 of Farm Klipplaat No. 109 Portion 4 (portion of portion 2) of Farm Klipplaat No. 109 • Portion 1 of the Farm Klipplaat No. 109 • Remainder Klipplaat No. 109 • Portion 1 of the Farm Uitvlugtfontein No. 265 • The Farm Riet Poort No. 9 • Remainder of Farm Driefontein No. 8 • Portion 3 of Farm Badfontein No. 10 (powerline alternative 1 route) • Remainder of Farm Leeuwenfontein No. 6 • Portion 2 of Farm Leeuwenfontein No. 6 • Portion 4 (a portion of portion 1) of Farm Allemansfontein No.7 • Portion 2 (a portion of portion 1) of Farm Allemansfontein No.7 • The Farm Klein Los Kop No.5 • Remainder of the Farm Schietkuil No.3

Table 1.2. The centre line co-ordinates of the 400m wide development corridor* are presented below for the proposed corridor alternatives:

	Preferred Alternative		**Alternative 1**		**Alternative 2**	
	Latitude	**Longitude**	**Latitude**		**Longitude**	
Start (on-site substation at Umsinde Emoyeni WEF site)	31°51'13.38"S	24° 1'25.58"E	31°51'13.38"S	24° 1'25.58"E	31°51'13.38"S	24° 1'25.58"E
Point 2	31°50'14.37"S	24° 0'50.32"E	31°50'14.37"S	24° 0'50.32"E	31°50'14.37"S	24° 0'50.32"E
Point 3	31°48'43.59"S	23°57'55.92"E	31°48'43.59"S	23°57'55.92"E	31°48'43.59"S	23°57'55.92"E
Start (on-site substation at Khangela Emoyeni WEF site)	31°48'43.05"S	23°57'42.71"E	31°48'43.05"S	23°57'42.71"E	31°48'43.05"S	23°57'42.71"E

Point 4	31°50'14.63"S	23°55'28.86"E	31°50'14.63"S	23°55'28.86"E	31°50'14.63"S	23°55'28.86"E
Point 5	31°49'13.74"S	23°53'33.39"E	31°49'13.74"S	23°53'33.39"E	31°49'13.74"S	23°53'33.39"E
Point 6	31°49'7.26"S	23°52'39.52"E	31°49'7.26"S	23°52'39.52"E	31°49'7.26"S	23°52'39.52"E
Point 7	31°47'31.74"S	23°49'11.72"E	31°47'31.74"S	23°49'11.72"E	31°47'31.74"S	23°49'11.72"E
Point 8	31°45'32.28"S	23°45'29.58"E	31°45'32.28"S	23°45'29.58"E	31°45'32.28"S	23°45'29.58"E
Point 9	31°43'29.18"S	23°45'1.23"E	31°44'1.56"S	23°42'34.93"E	31°44'1.56"S	23°42'34.93"E
Point 10	31°42'48.88"S	23°40'11.59"E	31°43'6.86"S	23°42'18.16"E	31°42'48.88"S	23°40'11.59"E
[redacted]			31°42'48.88"S	23°40'11.59"E	[redacted]	
Point 11 (Ishwati Collector Sub)	31°42'24.42"S	23°39'30.33"E	31°42'24.42"S	23°39'30.33"E	31°42'24.42"S	23°39'30.33"E
Point 12	31°42'34.31"S	23°38'58.91"E	31°42'34.31"S	23°38'58.91"E	31°42'34.31"S	23°38'58.91"E
Point 13	31°43'9.01"S	23°38'11.49"E	31°43'9.01"S	23°38'11.49"E	31°43'9.01"S	23°38'11.49"E
Point 14	31°43'54.78"S	23°35'20.23"E	31°43'54.78"S	23°35'20.23"E	31°43'54.78"S	23°35'20.23"E
Point 15	31°40'58.19"S	23°25'27.11"E	31°40'58.19"S	23°25'27.11"E	31°40'58.19"S	23°25'27.11"E
End (Extended 1.91 km^2 development corridor to (Gamma Substation) Preferred Alternative from the east	31°40'46.22"S	23°24'46.55"E	31°40'46.22"S	23°24'46.55"E	31°40'46.22"S	23°24'46.55"E
End (Extended 1.91 km^2 development corridor to Gamma Substation) Preferred Alternative from the south	31°40'56.04"S	23°24'40.11"E	31°40'56.04"S	23°24'40.11"E	31°40'56.04"S	23°24'40.11"E

Table 1.3. **Water Crossing Points along the 132kV Powerline within a 400m-wide corridor and gravel access track approximately 7m wide from the Umsinde Emoyeni switching station and extended 1.91 km^2 corridor to the Gamma Substation (Preferred Alternative):**

Gamma Substation to Ishwati Switching Station					
Watercourse Crossing	GPS Coordinates		Watercourse Crossing	GPS Coordinates	
	Latitude	Longitude		Latitude	Longitude
1	31° 40.895'S	23° 25.233'E	16	31° 43.839'S	23° 35.129'E
2	31° 41.036'S	23° 25.743'E	17	31° 43.889'S	23° 35.303'E
3	31° 41.303'S	23° 26.688'E	18	31° 43.853'S	23° 35.487'E
4	31° 41.551'S	23° 27.579'E	19	31° 43.738'S	23° 35.826'E
5	31° 41.647'S	23° 27.969'E	20	31° 43.660'S	23° 36.141'E
6	31° 41.776'S	23° 28.327'E	21	31° 43.518'S	23° 36.634'E
7	31° 41.815'S	23° 28.474'E	22	31° 43.458'S	23° 36.905'E
8	31° 42.067'S	23° 29.346'E	23	31° 43.453'S	23° 36.987'E
9	31° 42.354'S	23° 30.316'E	24	31° 43.389'S	23° 37.208'E
10	31° 42.405'S	23° 30.479'E	25	31° 43.261'S	23° 37.699'E
11	31° 42.538'S	23° 30.925'E	26	31° 43.238'S	23° 37.813'E
12	31° 42.772'S	23° 31.654'E	27	31° 43.229'S	23° 37.905'E
13	31° 43.233'S	23° 33.111'E	28	31° 43.178'S	23° 38.061'E
14	31° 43.362'S	23° 33.570'E	29	31° 43.082'S	23° 38.300'E
15	31° 43.536'S	23° 34.080'E	30	31° 42.930'S	23° 38.518'E

Ishwati Switching Station to Khangela Switching Station					
Watercourse Crossing	GPS Coordinates		Watercourse Crossing	GPS Coordinates	
	Latitude	Longitude		Latitude	Longitude
31	31° 42.866'S	23° 40.290'E	58	31° 47.823'S	23° 49.804'E
32	31° 43.284'S	23° 41.134'E	59	31° 47.901'S	23° 49.951'E
33	31° 43.688'S	23° 41.937'E	60	31° 48.006'S	23° 50.198'E
34	31° 42.898'S	23° 41.616'E	61	31° 48.066'S	23° 50.364'E
35	31° 43.027'S	23° 42.364'E	62	31° 48.259'S	23° 50.708'E
36	31° 44.009'S	23° 42.534'E	63	31° 48.621'S	23° 51.486'E
37	31° 43.178'S	23° 43.374'E	64	31° 48.904'S	23° 52.183'E
38	31° 43.261'S	23° 44.255'E	65	31° 49.041'S	23° 52.498'E
39	31° 43.293'S	23° 44.328'E	66	31° 49.190'S	23° 52.867'E
40	31° 44.504'S	23° 43.539'E	67	31° 49.215'S	23° 53.392'E
41	31° 44.270'S	23° 45.237'E	68	31° 49.404'S	23° 53.891'E
42	31° 44.826'S	23° 44.149'E	69	31° 49.442'S	23° 53.813'E
43	31° 45.124'S	23° 44.700'E	70	31° 49.598'S	23° 54.228'E
44	31° 44.812'S	23° 45.526'E	71	31° 49.640'S	23° 54.290'E
45	31° 45.537'S	23° 45.494'E	72	31° 49.691'S	23° 54.376'E
46	31° 45.845'S	23° 46.109'E	73	31° 49.860'S	23° 54.672'E
47	31° 45.739'S	23° 45.958'E	74	31° 50.021'S	23° 54.889'E
48	31° 45.629'S	23° 45.691'E	75	31° 50.088'S	23° 55.079'E
49	31° 46.235'S	23° 46.853'E	76	31° 50.152'S	23° 55.217'E
50	31° 46.547'S	23° 47.440'E	77	31° 49.854'S	23° 56.055'E
51	31° 46.717'S	23° 47.775'E	78	31° 49.748'S	23° 56.220'E

52	31° 46.785'S	23° 47.899'E	**79**	31° 49.677'S	23° 56.303'E
53	31° 47.088'S	23° 48.482'E	**80**	31° 49.532'S	23° 56.461'E
54	31° 47.290'S	23° 48.698'E	**81**	31° 49.124'S	23° 56.975'E
55	31° 47.414'S	23° 48.959'E	**82**	31° 48.830'S	23° 57.425'E
56	31° 47.492'S	23° 49.051'E	**83**	31° 48.558'S	23° 57.715'E
57	31° 47.708'S	23° 49.547'E	**84**	31° 48.759'S	23° 57.831'E

Khangela Switching Station to Umsinde Switching Station		
Watercourse Crossing	**GPS Coordinates**	
	Latitude	**Longitude**
83	31° 48.558'S	23° 57.715'E
84	31° 48.759'S	23° 57.831'E
85	31° 48.886'S	23° 58.233'E
86	31° 49.101'S	23° 58.643'E
87	31° 49.438'S	23° 59.251'E
88	31° 49.489'S	23° 59.362'E
89	31° 49.750'S	23° 59.910'E
90	31° 50.062'S	24° 00.493'E
91	31° 50.317'S	24° 00.890'E

Table 1.4. Proposed New Access Road Co-ordinates to the authorised Ishwati Substation site:

	Latitude	**Longitude**
Start (off the existing unnamed gravel road)	31° 44.203'S	23° 46.714'E
Middle	31° 42.906'S	23° 42.942'E
End (Authorised Ishwati Substation site)	31° 42.407'S	23° 39.506'E

In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations [4 December 2014, Government Notice (GN) R982, R983, R984 and R985, as amended], various aspects of the proposed developments may have an impact on the environment and are considered to be listed activities. These activities require authorisation from the National Competent Authority (CA), namely the Department of Forestry, Fisheries and the Environment (DFFE), prior to the commencement thereof. Further to this as per GN R. 2313 : ***Adoptions of the standard for the development and expansion of powerlines and substation with identified geographical areas and the exclusion of this infrastructure from the requirements to obtain Environmental Authorisation*** , the Standard was adopted in terms of section 24(10)(a) of the Act for the purpose of excluding the activities contemplated in paragraph 5.1 and 5.2 of the Schedule from the requirement to obtain environmental authorisation prior to commencement. In terms of the procedural requirement set out in the standard, screening tool reports have been undertaken for the grid corridor and associated infrastructure and site sensitivity verifications have been undertaken by the relevant specialists in accordance with the sensitivity themes. As per 6.1. of the GNR .2313, "Where any part of the infrastructure occurs on an area for which the environmental sensitivity for any environmental theme is identified as being very high or high by the national web based environmental screening tool and confirmed to be such through the application of the procedures set out in the Standard", the site sensitivity verifications have been performed as per the procedural requirements set out.

In accordance with GN 320 and GN 1150 (20 March 2020)[1] of the NEMA EIA Regulations of 2014 (as amended), prior to commencing with a specialist assessment, a site sensitivity verification must be undertaken to confirm the current land use and environmental sensitivity of the proposed project areas as identified by the National Web-Based Environmental Screening Tool (i.e., Screening Tool). NuLeaf Planning and Environmental, as Visual specialists, have been commissioned to verify the sensitivity of the project sites under these specialist protocols.

The scope of this report is for one (1) application, namely the 132KV grid connection infrastructure, associated access tracks & water course crossings associated with the authorised Emoyeni wind energy facilities, near Murraysburg, Beaufort West and Ubuntu Local Municipalities and Central Karoo and Pixely ka Seme District Municipalities, Western Cape, and Northern Cape Provinces.

2. SITE SENSITIVITY VERIFICATION METHODOLOGY

The following information sources were consulted to compile this report:

- Topographical maps and GIS generated data were sourced from the Surveyor General, Surveys and Mapping in Mowbray, Cape Town;
- Observations made and photographs taken during site visits;
- Professional judgement based on experience gained from similar projects; and
- Literature research on similar projects.

3. OUTCOME OF SITE SENSITIVITY VERIFICATION

No specific mention to visual impact sensitivity was made in the DFFE screening tool, however based on the findings of the site visit and the observations made below, the sensitivity of the visual environment is considered to be moderate to high.

The topography of the study area is undulating with mountainous areas at the start of the power line in the vicinity of the proposed Umsinde switching station whereby the OHL traverses a high lying area of 1710 metres above mean sea level (m.a.m.s.l.) where it connects to the Khangela switching station. From here the OHL traverses over Trouberg, passes between Driekop and Bakenskop where it connects to the Ishwati switching station. The elevation ranges from 1500 to 1230 m.a.m.s.l From the Ishwati switching station the OHL travels over slightly lower lying land to the Gamma substation. Elevation is approximately 1200 m.a.m.s.l.

The land cover within the study area is predominately low shrubland and bare rock and soil with small scattered areas of dryland agriculture. As a result, the landscape is characterised by wide-open expanses of extreme isolation. Overall, the Visual Absorption Capacity (VAC) of the receiving environment is deemed to be low by virtue of the low growing vegetation and sparsely populated/limited development overall.

The majority of the study area is sparsely populated and consists of a landscape of wide-open expanses. The scarcity of water and other natural resources has influenced settlement within this region, keeping numbers low, and distribution limited to the availability of permanent water. Settlements, where they occur, are usually rural homesteads and farmsteads.

---

[1] GN 320 (20 March 2020): Procedures for The Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation

Access to the study area is via the N1 and secondary roads which link with one another, providing access to farmsteads.

Other industrial infrastructure within the study area includes the existing Gamma and Victoria Cap Substations in the west of the study area. Additionally existing high voltage power lines traverse the study area in the west from north to south.

The N1 is a national road and is the main link from Gauteng to Cape Town. Seeing as the N1 is a main route serving the region, it can be considered to be a route that is most likely to carry tourists. The R63 can also be considered an alternative route to Graaf-Reinet which is a popular tourist town located within the Camdeboo National Park in the Eastern Cape Province.

4. CONCLUSION

The high visual quality of the region, as well as the very low occurrence and scattered nature of sensitive visual receptors in close proximity to the proposed 132KV grid connection infrastructure, associated access tracks & water course crossings was confirmed during the site visit on 3 April 2022.

The landscape character of the study area and site itself is largely undeveloped and natural with wide-open expanses. However, there is some industrial infrastructure within the study area which includes the existing Gamma and Victoria Cap Substations and high voltage power lines.

The study area is located predominately within the Nama Karoo biome, with rainfall ranging from 123 mm -248 mm per annum. This scarcity of water and other natural resources has influenced settlement within this region, keeping numbers low, and distribution limited to the availability of permanent water.

Homesteads and farmsteads, by virtue of their visually exposed nature, are considered to be sensitive visual receptors. Residential receptors in natural contexts are more sensitive than those in more built-up contexts, due to the absence of visual clutter in these undeveloped and undisturbed areas. Commuters and possible tourists using the national and secondary roads may also be negatively impacted upon by the visual exposure to the proposed infrastructure, however, this intrusion would be fleeting.

Therefore based on these findings (in the absence of visual sensitivity in the DFFE screening tool) it can be stated that the sensitivity of the visual environment is moderate to high.

Bryony van Niekerk
Environmental Assessment Practitioner
EAPASA Reg nr: 2019/655