PROPOSED GRID CONNECTION INFRASTRUCTURE FOR THE ZONNEQUA WIND FARM, NORTHERN CAPE PROVINCE

VISUAL IMPACT ASSESSMENT

Produced for:

Genesis Zonnequa Wind (Pty) Ltd

On behalf of:

Savannah Environmental (Pty) Ltd
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1. STUDY APPROACH

1.1. Qualification and experience of the practitioner

Lourens du Plessis, a specialist in visual impact assessment and Geographical Information Systems (GIS), undertook the Visual Impact Assessment (VIA). Lourens has undertaken a number of VIAs within the region including, Project Blue, Kleinzee and the Koingnaas Wind Energy Facilities (WEFs).

He has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990. He has extensive practical knowledge in spatial analysis, environmental modeling and digital mapping, and applies this knowledge in various scientific fields and disciplines. His expertise are often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

He 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.

Savannah Environmental appointed Lourens du Plessis as an independent specialist consultant to undertake the visual impact assessment for the proposed grid connection infrastructure for the Zonnequa Wind Farm. He will not benefit from the outcome of the project decision-making.

1.2. Assumptions and limitations

This assessment was undertaken during the planning stage of the project and is based on information available at that time.

1.3. 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.

[1] Adapted from Oberholzer (2005).

- The information available, understanding of the study area 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/or 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/or the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

Table 1: Level of confidence.

	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

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 high:*

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

1.4. Methodology

The study was undertaken using GIS technology as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed project infrastructure. A detailed Digital Terrain Model (DTM) for the study area was created from 5m interval contours supplied by the Chief Directorate National Geo-Spatial Information.

Visual Impact Assessment (VIA)

The VIA is determined according to the nature, extent, duration, intensity or magnitude, probability and significance of the potential visual impacts, and will propose management actions and/or monitoring programs, and may include recommendations related to the proposed grid infrastructure for the Zonnequa Wind Farm.

The visual impact is determined for the highest impact-operating scenario (worst-case scenario) and varying climatic conditions (i.e. different seasons, weather conditions, etc.) are not considered.

The VIA considers potential cumulative visual impacts, or alternatively the potential to concentrate visual exposure/impact within the region.

The following VIA-specific tasks were undertaken:

- **Determine potential visual exposure**

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

  Viewshed analyses from the proposed alignment/location indicate the potential visibility.

- **Determine visual distance/observer proximity to the grid connection infrastructure**

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

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

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

- **Determine viewer incidence/viewer perception (sensitive visual receptors)**

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

  This is the capacity of the receiving environment to absorb the potential visual impact of the proposed structures. The visual absorption capacity (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 structure in terms of texture, colour, form and light / shade characteristics of the structure. On the other hand, the VAC for a structure 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 structure decreases.

The digital terrain model utilised in the calculation of the visual exposure of the grid connection infrastructure does not incorporate the potential 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, supplemented with field observations.

- **Calculate the visual impact index**

  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 impact significance**

  The potential visual impacts are quantified in their respective geographical locations in order to determine the significance of the anticipated impact on identified receptors. Significance is determined as a function of extent, duration, magnitude (derived from the visual impact index) and probability. Potential cumulative and residual visual impacts are also addressed. The results of this section are displayed in impact tables and summarised in an impact statement.

- **Propose mitigation measures**

  Mitigation measures will be proposed in terms of the planning, construction, operation and decommissioning phases of the project.

- **Reporting and map display**

  All the data categories, used to calculate the visual impact index, and the results of the analyses will be displayed as maps in the accompanying report. The methodology of the analyses, the results of the visual impact assessment and the conclusion of the assessment will be addressed in the VIA report.

- **Site visit**

  Undertake a site visit 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.

2. BACKGROUND

Genesis Zonnequa Wind (Pty) Ltd proposes the construction and operation of a grid connection solution for the proposed Zonnequa Wind Farm, near Kleinsee, Northern Cape Province. The grid connection solution will include the development of a double-circuit 132kV power line (known as the Strandveld-Gromis 132kV double-circuit power line) and collector substation (known as the Strandveld Substation) to connect the proposed Zonnequa Wind Farm to the national grid. Other associated infrastructure will also be required for the grid connection solution, including access tracks/roads, administrative buildings and laydown areas.

A corridor 300m wide and 22km long is being assessed to allow for the optimisation of the grid and associated infrastructure and to accommodate environmental sensitivities. The grid infrastructure will be developed within the 300m corridor. The height of the power line pylons will be up to 32m and the servitude width of the power line will be 31m. The extent of the Strandveld Substation will be 100m x 200m and the capacity of the substation will be 132kV. Three grid connection options exist within the 300m corridor, namely:

- A direct connection from the Strandveld Substation to the existing Gromis Substation located ~18km from the northern boundary of the Zonnequa Wind Farm project site. This is considered to be the preferred option from a technical perspective due to the fact that the Gromis Substation already exists.
- A loop-in loop-out connection from the Strandveld Substation to the proposed Rooivlei-Gromis 132kV double-circuit power line which forms part of the Namas Wind Farm grid connection solution. The proposed Rooivlei-Gromis 132kV double circuit power line is located ~800m to the east of the Strandveld substation. This option is only viable should the Namas Wind Farm be developed.
- A direct connection from the Strandveld Substation to the proposed collector substation (known as the Rooivlei Substation) which forms part of the Namas Wind Farm grid connection solution. The Rooivlei Substation is located ~7km south of the Strandveld Substation. This option is only viable should the Namas Wind Farm be developed.

3. SCOPE OF WORK

This report is the undertaking of a Visual Impact Assessment (VIA) of the proposed grid connection infrastructure as mentioned above.

The determination of the potential visual impacts is undertaken in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure.

The study area for the visual assessment encompasses a geographical area of approximately 1,313km² (the extent of the maps displayed in this report) and includes a minimum 3km buffer zone from the proposed 300m corridor.

Anticipated issues related to the potential visual impact of the proposed grid connection infrastructure include the following:

- The visibility of the double-circuit 132kV power line and collector substation to, and potential visual impact on, observers travelling along arterial (i.e. the R355 to Kleinsee) and secondary roads (Komaggas to Kleinsee and Koingnaas to Kleinsee) in close proximity to the proposed power line and collector substation.

- The visibility of the double-circuit 132kV power line and collector substation to, and potential visual impact on homesteads/farmsteads located in close proximity to the proposed grid connection infrastructure.

- The potential visual impact of the double-circuit 132kV power line and collector substation on the visual character of the landscape and sense of place of the region, with specific reference to tourist routes, tourist destinations and the tourist potential of the region, especially in terms of events such as the Namaqualand flower displays.

- The potential cumulative visual impact (or alternatively the consolidation of visual impacts) of the proposed double-circuit 132kV power line and collector substation in context of its alignment adjacent to the approved Eskom Gromis to Juno 400kV power line.

- Potential visual impacts associated with the construction phase.

- Potential residual visual impacts after the decommissioning of the grid connection infrastructure.

- 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 and/or regional scale.

4. RELEVANT LEGISLATION AND GUIDELINES

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

- The Environmental Impact Assessment Regulations, 2014 (as amended);
- Guideline on Generic Terms of Reference for EAPS and Project Schedules (DEADP, Provincial Government of the Western Cape, 2011).

5. THE AFFECTED ENVIRONMENT

Topography, vegetation and hydrology

The study area (including the 300m corridor) is located on land that ranges in elevation from sea level at the coast to approximately 526m above sea level at the top of the Brandberg hill. These hills and the Langberg hill further south, are the most prominent topographical features within the region.

The terrain surrounding the 300m corridor is generally flat, sloping gently westwards towards the shore. The terrain type of the region is described as *slightly undulating plains*. Refer to **Map 1**.

The arid climate of the study area is dry, receiving between 28mm and 123mm of rainfall per annum. Land cover is primarily *low shrubland* with localised areas of *exposed rock and sand* and limited *woodland* or *open bushland*. The vegetation type is *Strandveld of the West Coast.* Refer to **Map 2** for the land cover.

The most prominent drainage lines or water courses are the Buffels River at the northern section of the 300m corridor and the Komaggas River to the east of the corridor.

Land use and settlement patterns

The region has a very low population density of 3 people per km^2[2]. The small town of Kleinsee lies about 18km north-west of the proposed Zonnequa Wind Farm site and 12.5km west from the 300m corridor (at the closest). Other than Melkbospunt and Grootmis, this town represents the only populated place or settlement within the study area. Individual homesteads/farmsteads are scattered throughout the region. Some of these in closer proximity to the 300m corridor include:

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[2] www.wikipedia.org/wiki/Nama_Khoi_Local_Municipality

- Manelsvlei
- Taaiboskrop
- Hoë Heuwel
- Lewies se Duin

Large parts of the region are mine-owned, and as a result, significant diamond mining activities are evident, especially within a 7km band along the coast north of Kleinsee. Other than the mining and prospecting activities, industrial infrastructure within the region includes a network of distribution power lines, a distribution substation at Kleinsee and the Gromis Transmission Substation north of the R355 arterial road. The study area is further traversed by the alignment of the future north-south spanning Gromis to Juno 400kV overhead power line. This line has been approved and designed, but not yet constructed. The proposed Strandveld-Gromis double-circuit 132kV power line intended to evacuate the electricity from the Zonnequa Wind Farm to the Gromis Substation is proposed parallel and adjacent to this alignment.

The greater region is generally seen as having a high scenic value and high tourism potential. It is well known for its scenic natural beauty (West Coast as a whole) and annual wild flower displays (Namaqualand)[3]. This occurs once a year between July and October, depending on a number of environmental factors, but mainly the occurance and duration of rainfall. The length of the display is also highly variable.

Within this scenic context, it is noteworthy that the mining areas along the coastline are significantly disturbed and visually apparent due to the scale and nature of the surface based mining. In this respect the visual quality of the receiving environment is already compromised to some extent.

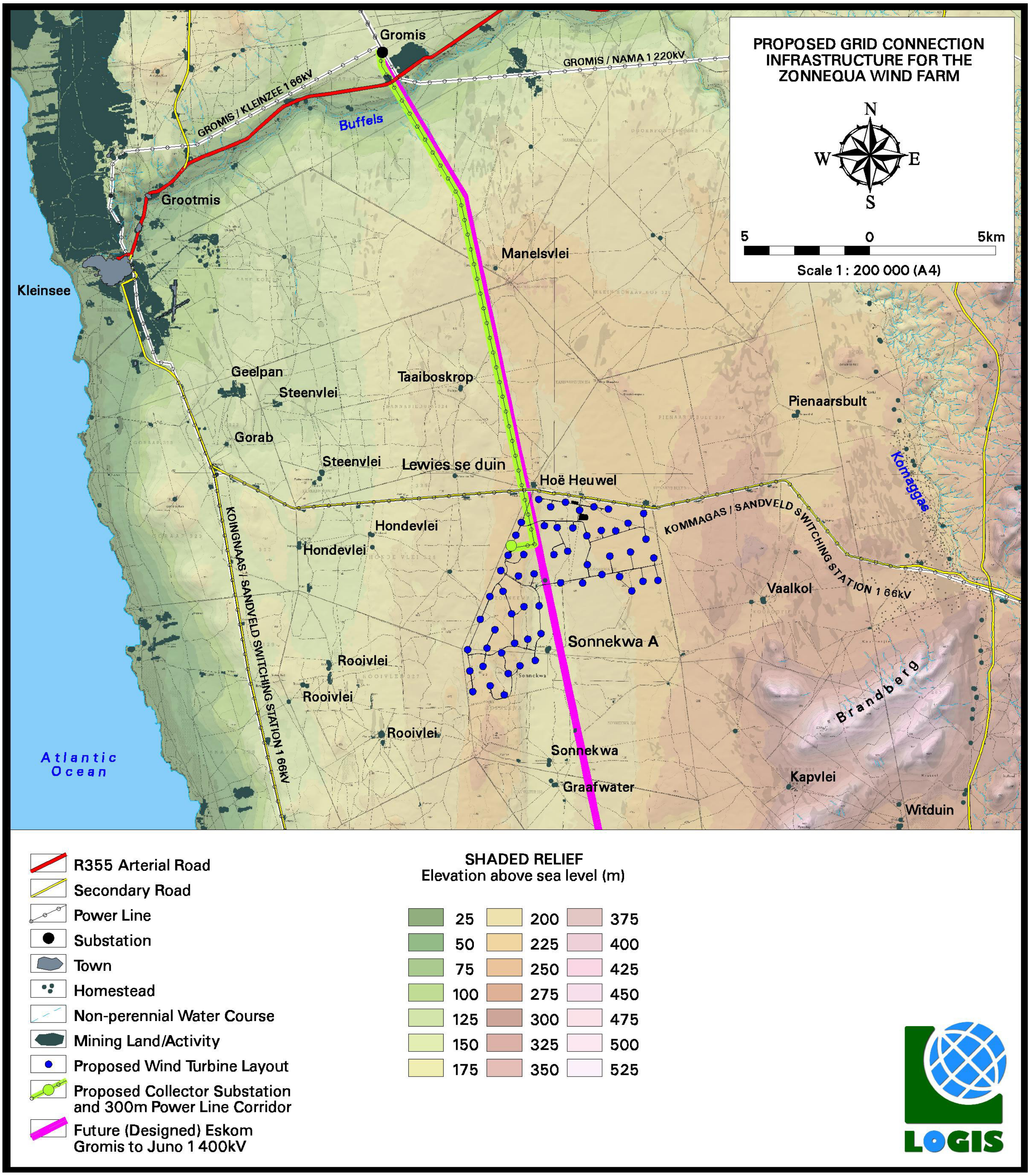
[3] Namaqualand stretches from the small town of Garies in the south to the Orange River to the north, its western border is the wild Atlantic coast, the remote town of Pofadder marks the eastern border (http://www.discoverthecape.com/namaqualand/flower-route.html)

Figure 1: The Koingnaas to Kleinsee road.

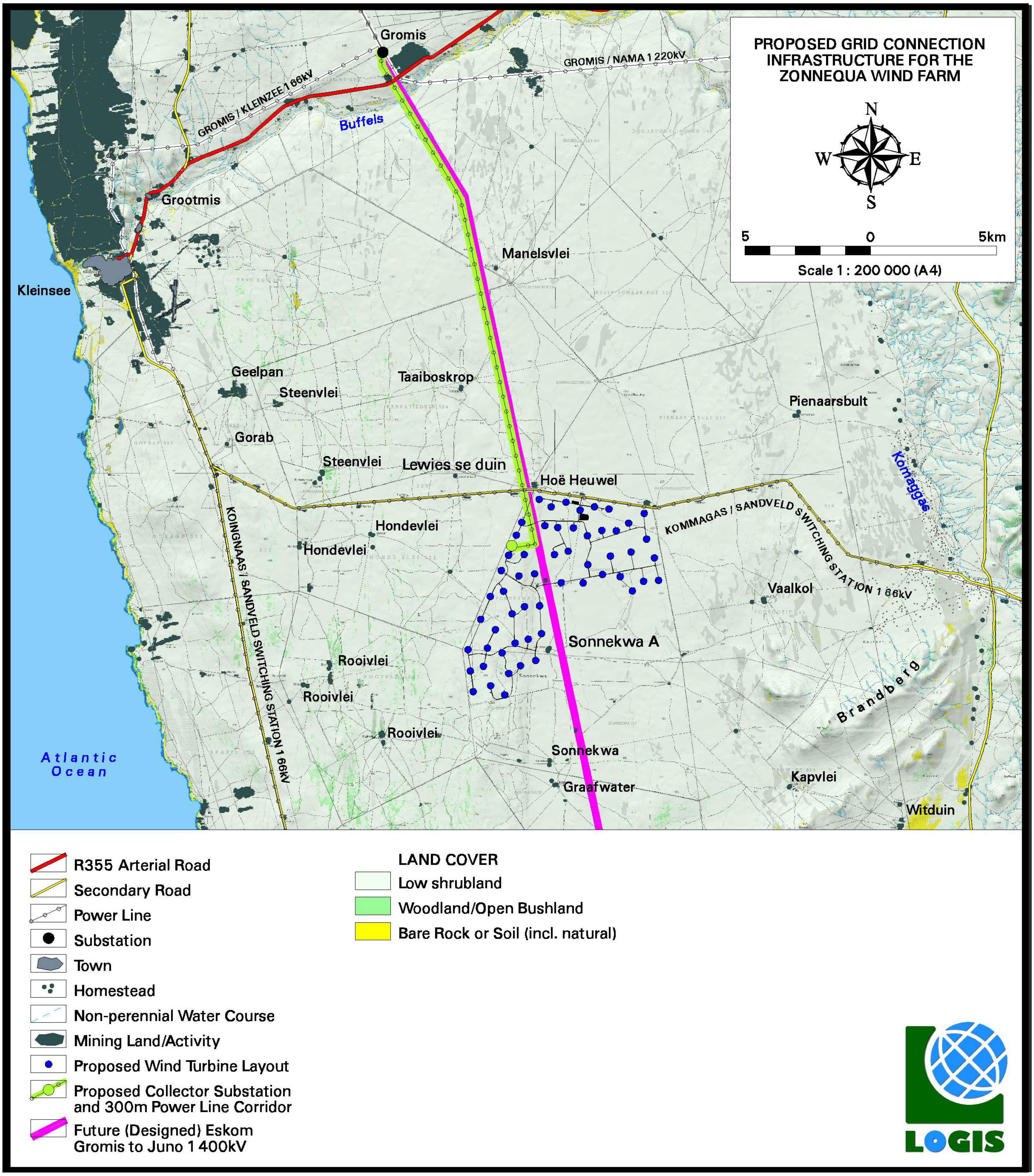
Figure 2: The Komaggas (east) to Kleinsee (west) road north of the proposed Zonnequa Wind Farm project site (to the left).

Figure 3: The road and houses at Grootmis.

Figure 4: Mine dumps and mining activity within the study area.



Map 1: Shaded relief map of the study area.



Map 2: Land cover and broad land use patterns.

6. RESULTS

6.1. Potential visual exposure

The visibility of the proposed grid connection infrastructure is shown on **Map 3**. The visibility analysis was undertaken along the alignment at an offset of 32m above average ground level (i.e. the maximum height of the power line structures), for a distance of 3km from the centre line. The viewshed analysis was restricted to a 3km radius due to the fact that visibility beyond this distance is expected to be negligible/highly unlikely for the relatively constrained vertical dimensions of this type of power line and the size of the collector substation (i.e. a double-circuit 132kV power line and 132kv collector substation).

The viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed double-circuit power line and collector substation, therefore signifying a worst-case scenario.

It is expected that the power line and collector substation may be visible within the 3km corridor and potentially highly visible within a 500m radius of the power line and substation structures, due to the generally flat terrain it traverses. Potential observers include residents of homesteads along the double-circuit power line and near the collector substation and commuters travelling along the secondary and arterial roads where the power line crosses.

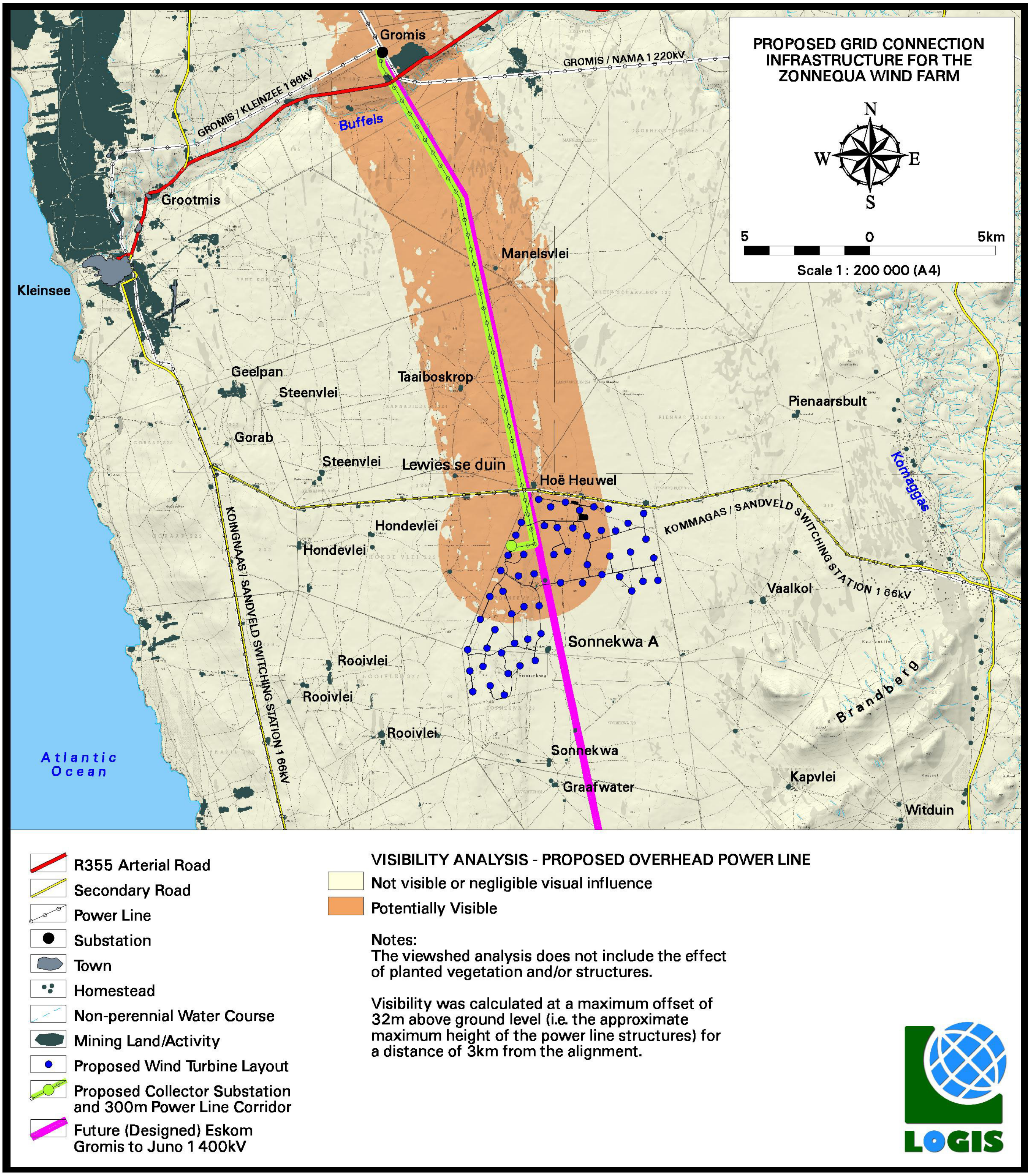
Homesteads expected to be visually influenced include:

- Hoë Heuwel
- Lewies se Duin
- Taaiboskrop
- Manelsvlei

Roads expected to be visually influenced include:

- R355 arterial road
- Komaggas-Kleinsee secondary road

The expected visual exposure will be largely offset once the much larger Gromis-Juno 400kV power line is constructed. The decision to align the proposed Strandveld-Gromis double-circuit 132kV power line with the 400kV line consolidates the linear infrastructure within the region, therefore mitigating the potential visual impact to a large degree.



Map 3: Viewshed analysis of the proposed grid connection infrastructures.

6.2. Potential cumulative visual exposure

The proposed grid connection infrastructure (specifically the double-circuit 132kV power line) is aligned adjacent to the authorised Gromis to Juno 400kV power line. The placement of the proposed double-circuit 132kV power line adjacent to an already authorised power line alignment will comply with the principle of consolidating the linear infrastructure within the region. The cumulative visual exposure of the proposed double-circuit 132kV power line will largely be overshadowed by the taller 400kV power line structures, effectively mitigating (to a large degree) the potential visual impacts associated with this power line.

6.3. Visual distance / observer proximity to the grid connection infrastructure

The proximity radii are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger power line structures (e.g. 400kV) and downwards for smaller power lines (e.g. 132kV). This methodology was developed in the absence of any known and/or acceptable standards for South African power line infrastructure.

The proximity radii (calculated from the 300m corridor) are shown on **Map 4** as follows:

- 0 – 0.5km - Short distance view where the structures would dominate the frame of vision and constitute a very high visual prominence.

- 0.5 – 1.5km - Medium distance views where the structures would be easily and comfortably visible and constitute a high visual prominence.

- 1.5 - 3km - Medium to longer distance view where the structures 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.

The visual distance theory and the observer's proximity to the double-circuit 132kV power line and collector substation are closely related, and especially relevant, when considered from areas with a high viewer incidence and a potentially negative visual perception of the proposed infrastructure.

6.4. Viewer incidence / viewer perception

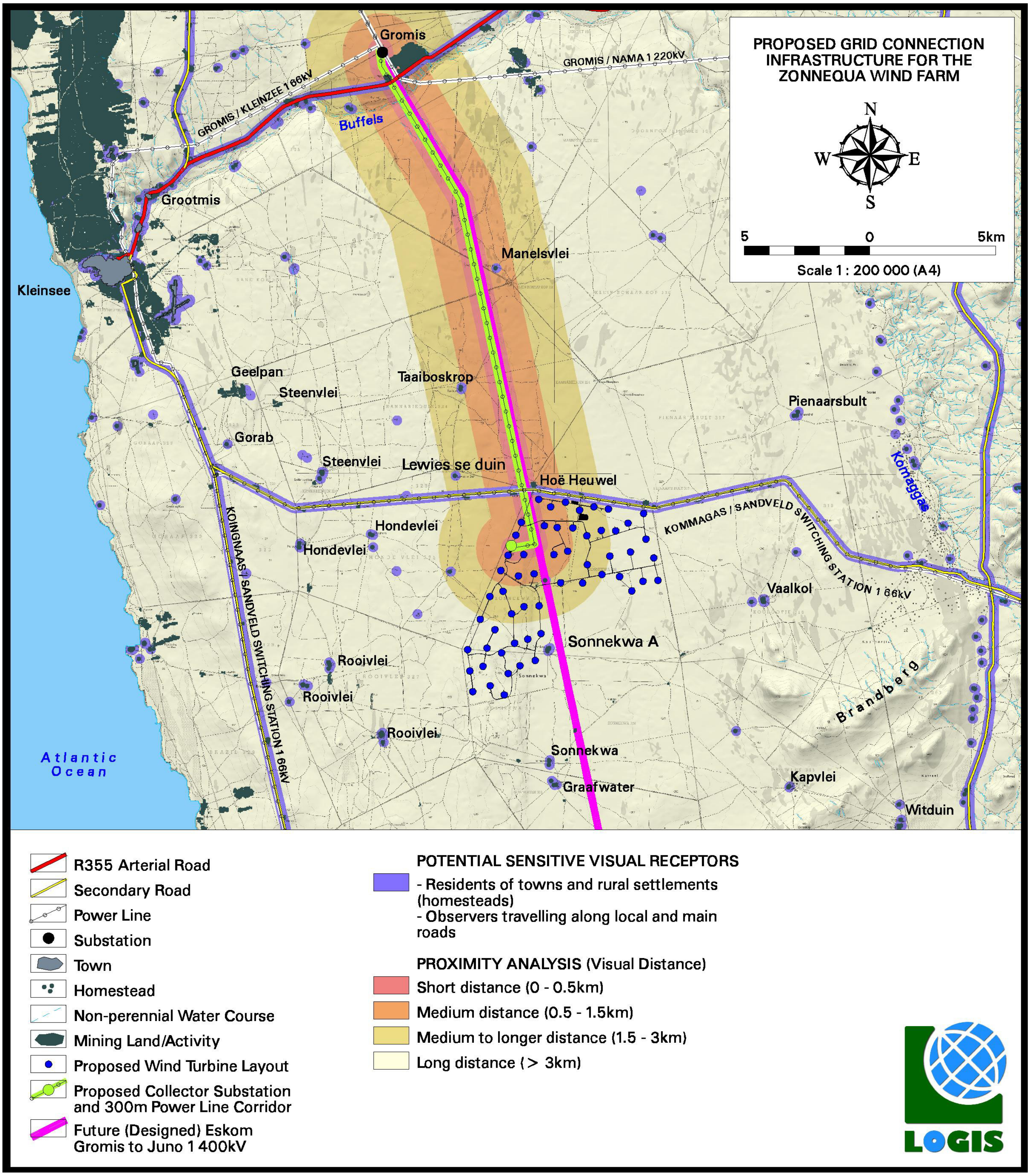
The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers or if the visual perception of the structure is favourable to all the observers, there would be no visual impact.

It is necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed grid connection 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, purpose of sighting, etc. which would create a myriad of options.

Viewer incidence is calculated to be the highest along the arterial and secondary roads within the study area. Commuters and tourists using these roads may be negatively impacted upon by visual exposure to the grid connection infrastructure.

Viewer incidence is generally low within the region, but may fluctuate according to tourism activity. Typically, during peak holiday seasons, over weekends, and particularly the flowering season in early spring, viewer incidence is expected to be higher than normal.

Additional sensitive visual receptors are located at the farm residences (homesteads) located throughout the study area. It is expected that the viewer's perception, unless the observer is associated with (or supportive of) the wind farm development (and the associated proposed grid connection infrastructure) within the region, would generally be negative. These potential sensitive visual receptors are listed in **Section 6.1** and displayed on **Map 4** below.



Map 4: Proximity analysis and potential sensitive visual receptors.

6.5. Visual absorption capacity

The land cover within the study area is dominated by *low shrubland.*

Low shrubland is described as:

Natural / semi-natural low shrub dominated areas, typically with < ± 2m canopy height, specifically associated with the Fynbos Biome. It includes a range of canopy densities encompassing sparse to dense canopy covers. Very sparse covers may be associated with the bare ground class. Note that taller tree / bush / shrub communities within this vegetation type are typically classified separately as one of the other tree or bush dominated cover classes.

Overall, the VAC of the receiving environment and especially the area in close proximity to the 300m corridor is deemed low by virtue of the nature of the vegetation and the absence of urban development.

The significant height of power line structures adds to the potential visual intrusion of the power line and the collector substation 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.

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

Figure 5: Photograph indicating the low VAC of the study area.

6.6. Visual impact index

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed grid connection infrastructure are displayed on **Map 5**. 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 visual exposure to the proposed grid connection infrastructure, a high viewer incidence and a potentially 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 and determining the potential **magnitude** of the visual impact.

General
The index indicates that the double-circuit 132kV power line and collector substation may only have a moderate visual impact within a 0.5km radius of the structures, due to the general absence of sensitive visual receptors. Where receptors do occur within this zone, the visual impact may be high.

The magnitude of visual impact on sensitive visual receptors subsides with distance to: low within a 0.5km – 1.5km radius, very low within a 1.5km – 3km radius and negligible beyond 3km from the structures. Potentially affected visual receptors are shown on **Map 5**.

The power line may have a **high** visual impact on the following observers:

Residents of:
- Hoë Heuwel

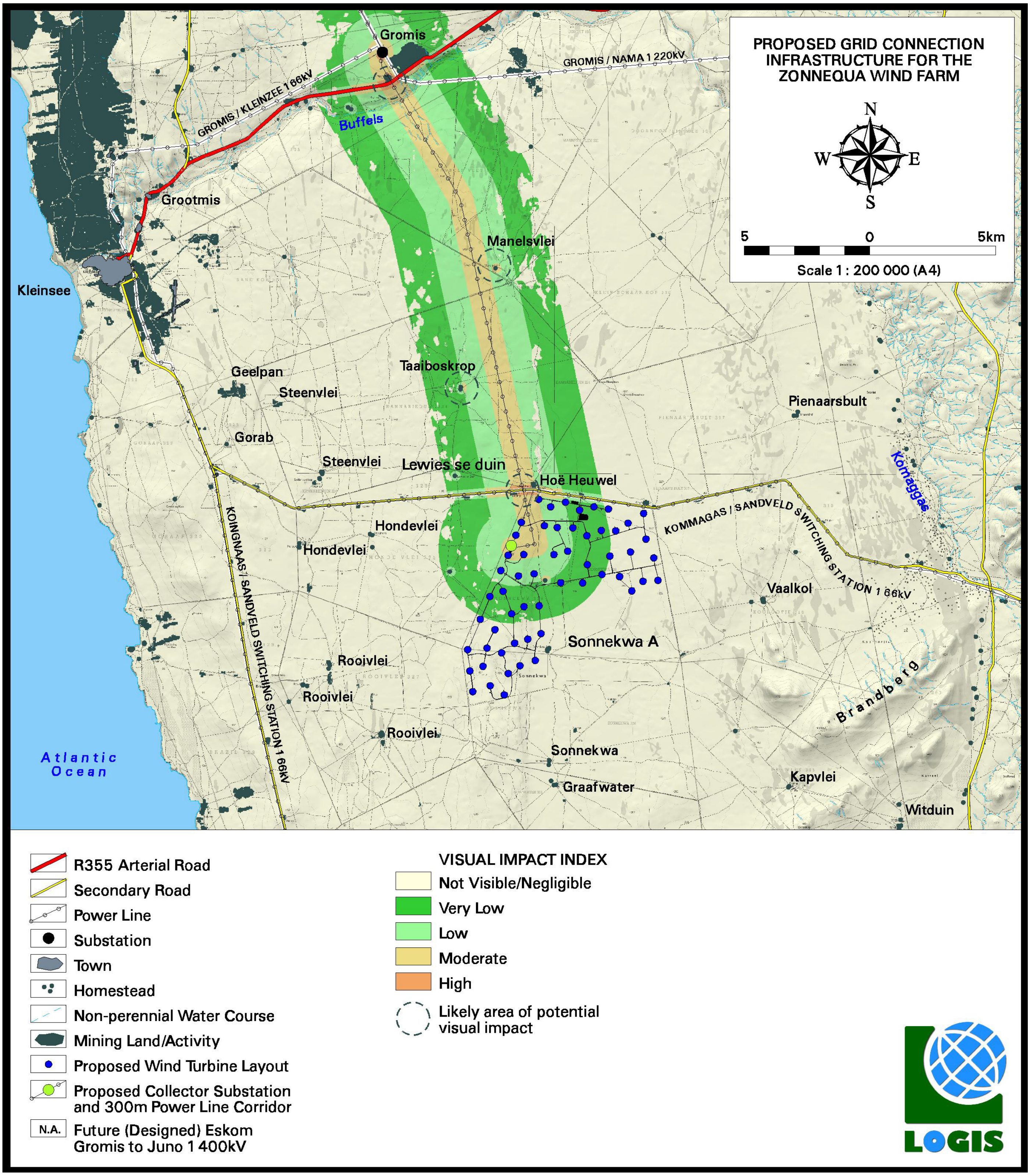
Observers travelling along the:
- Komaggas-Kleinsee secondary road where the double-circuit 132kv power line crosses this road
- The R355 arterial road where the double-circuit 132kV power line crosses this road

The power line may have a **moderate** visual impact on the following observers:

Residents of:
- Taaiboskrop
- Manelsvlei

Note:
Where homesteads are derelict or deserted, the visual impact will be non-existent, until such time as it is inhabited again.

The collector substation (located within the Zonnequa Wind Farm) is not expected to be particularly visually intrusive due to the presence of the much taller wind turbine structures.



Map 5: Visual impact index.

6.7. Visual impact assessment: impact rating 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 (see **Section 3:** SCOPE OF WORK) 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 power line alignment) and includes a table quantifying the potential visual impact according to the following criteria:

- **Extent** - site only (very low = 1), local (low = 2), regional (medium = 3), national (high = 4) or international (very high = 5)[4].
- **Duration** - very short (0-1 yrs. = 1), short (2-5 yrs. = 2), medium (5-15 yrs. = 3), long (>15 yrs. = 4), and permanent (= 5).
- **Magnitude** - None (= 0), minor (= 2), low (= 4), medium/moderate (= 6), high (= 8) and very high (= 10)[5].
- **Probability** – very improbable (= 1), improbable (= 2), probable (= 3), highly probable (= 4) and definite (= 5).
- **Status** (positive, negative or neutral).
- **Reversibility** - reversible (= 1), recoverable (= 3) and irreversible (= 5).
- **Significance** - low, medium or high.

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**).

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

- <30 points: Low (where the impact would not have a direct influence on the decision to develop in the area)
- 31-60 points: Medium/moderate (where the impact could influence the decision to develop in the area)
- >60: High (where the impact must have an influence on the decision to develop in the area)

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[4] Local = within 0.5km of the 300m corridor. Regional = between 0.5 - 3km from the a300m corridor.

[5] This value is read from the visual impact index. Where more than one value is applicable, the higher of these will be used as a worst case scenario.

6.8. Visual impact assessment

The primary visual impacts of the proposed grid connection infrastructure for the Zonnequa Wind Farm are assessed as follows:

6.8.1. Construction impacts

Potential visual impact of construction activities on sensitive visual receptors in close proximity to the proposed grid connection infrastructure.

During construction, there may be an increase in heavy vehicles utilising the roads to the 300m corridor that may cause, at the very least, a visual nuisance to other road users and landowners in the area.

Construction activities may potentially result in a **low** (significance rating = 20) temporary visual impact both before and after (significance rating = 16) mitigation.

Table 2: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed grid connection infrastructure within the 300m corridor.

Nature of Impact: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed grid connection infrastructure.		
	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Short term **(2)**	Short term **(2)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(20)**	Low **(16)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation: Planning: ➢ Retain and maintain natural vegetation immediately adjacent to the development footprint/servitude. Construction: ➢ Ensure that vegetation is not unnecessarily removed during the construction phase. ➢ 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 area and existing access roads. ➢ Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of 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.
Residual impacts: None, provided rehabilitation works are carried out as specified.

6.8.2. Potential visual impact on sensitive visual receptors located within a 0.5km radius of the grid connection infrastructure during the operation phase

The double-circuit 132kV power line is expected to have a **low** visual impact (significance rating = 28) on observers traveling along the roads and residents of homesteads within a 0.5km radius of the grid connection infrastructure.

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice. The table below illustrates this impact assessment.

Table 3: Visual impact on observers in close proximity to the proposed grid connection infrastructure.

Nature of Impact: Visual impact on observers travelling along the roads and residents at homesteads in close proximity to the grid connection infrastructure.		
	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(28)**	Low **(28)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	

Mitigation / Management: <u>Planning:</u> ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. <u>Operations:</u> ➢ Maintain the general appearance of the servitude as a whole. <u>Decommissioning:</u> ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.
Residual impacts: The visual impact will be removed after decommissioning, provided the grid connection infrastructure is removed. Failing this, the visual impact will remain.

6.8.3. Potential visual impact on sensitive visual receptors within the region (0.5 – 3km radius) during the operation of the grid infrastructure

The double-circuit 132kV power line and collector substation will have a **low** visual impact (significance rating = 22) on observers traveling along the roads and residents of homesteads within a 0.5 - 3km radius of the grid connection infrastructure.

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice. The table below illustrates this impact assessment.

Table 4: Visual impact of the proposed grid connection infrastructure within the region.

Nature of Impact: Visual impact on observers travelling along the roads and residents at homesteads within a 0.5 – 3km radius of the grid connection infrastructure.		
	Without mitigation	***With mitigation***
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(22)**	Low **(22)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation / Management: <u>Planning:</u> ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. <u>Operations:</u> ➢ Maintain the general appearance of the servitude as a whole. <u>Decommissioning:</u> ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		

Residual impacts: The visual impact will be removed after decommissioning, provided that the grid connection infrastructure is removed. Failing this, the visual impact will remain.

6.9. Visual impact assessment: secondary impacts

The potential visual impact of the proposed grid connection infrastructure on the 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, 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.), plays a significant role.

An 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.

The greater environment has a rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality.

The anticipated visual impact of the proposed grid connection infrastructure on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance. This is due to the relatively low viewer incidence within close proximity to the 300m corridor and the presence of the existing mining activities and electricity infrastructure.

Table 5: The potential impact on the sense of place of the region.

Nature of Impact: The potential impact of the development of the proposed grid connection infrastructure on the sense of place of the region.		
	Without mitigation	***With mitigation***
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(22)**	Low **(22)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. Operations: ➢ Maintain the general appearance of the servitude as a whole. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		

Residual impacts: The visual impact will be removed after decommissioning, provided the grid connection infrastructure is removed. Failing this, the visual impact will remain.

The potential cumulative visual impact of the proposed grid connection infrastructure on the visual quality of the landscape.

The construction of the grid connection infrastructure for the Zonnequa Wind Farm will increase the cumulative visual impact of industrial type infrastructure within the region.

On the other hand the location of the double-circuit 132kV power line adjacent to the (much larger) authorised Gromis to Juno 400kV power line is expected to mitigate the potential visual impact to some degree, or at the very least, not expected to aggravate the visual impact (of the smaller double-circuit 132kV power line).

The anticipated cumulative visual impact of the proposed power lines is expected to be of **moderate** significance, which is considered to be acceptable from a visual perspective. This is once again due to the relatively low viewer incidence within close proximity to the proposed alignments and the presence of the existing mining activities and electricity infrastructure.

Table 6: The potential cumulative visual impact on the visual quality of the landscape.

<table>
<tr><td colspan="3">Nature of Impact:
The potential cumulative visual impact of the grid infrastructure on the visual quality of the landscape.</td></tr>
<tr><td></td><td>Overall impact of the proposed project considered in isolation</td><td>Cumulative impact of the project and other projects within the area</td></tr>
<tr><td>Extent</td><td>Local (2)</td><td>Local (2)</td></tr>
<tr><td>Duration</td><td>Long term (4)</td><td>Long term (4)</td></tr>
<tr><td>Magnitude</td><td>High (8)</td><td>High (8)</td></tr>
<tr><td>Probability</td><td>Improbable (2)</td><td>Probable (3)</td></tr>
<tr><td>Significance</td><td>Low (28)</td><td>Moderate (42)</td></tr>
<tr><td>Status (positive, neutral or negative)</td><td>Negative</td><td>Negative</td></tr>
<tr><td>Reversibility</td><td>Recoverable (3)</td><td>Recoverable (3)</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No</td><td>No</td></tr>
<tr><td>Can impacts be mitigated?</td><td colspan="2">No, only best practise measures can be implemented</td></tr>
<tr><td colspan="3">Generic best practise mitigation/management measures:
<u>Planning:</u>
➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude.
<u>Operations:</u>
➢ Maintain the general appearance of the servitude as a whole.
<u>Decommissioning:</u>
➢ Remove infrastructure not required for the post-decommissioning use.
➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.</td></tr>
<tr><td colspan="3">Residual impacts:
The visual impact will be removed after decommissioning, provided the grid infrastructure is removed. Failing this, the visual impact will remain.</td></tr>
</table>

6.10. The potential to mitigate visual impacts

The primary visual impact, namely the appearance of the proposed grid connection infrastructure is not possible to mitigate. The functional design of the structures cannot be changed in order to reduce visual impacts.

Secondary impacts anticipated as a result of the proposed grid connection infrastructure (i.e. visual character and sense of place) are also not possible to mitigate.

The following mitigation is, however possible:

- Retain/re-establish and maintain natural vegetation in all areas immediately adjacent to the development footprint/servitude. This measure will help to soften the appearance of the grid connection infrastructure within its context.

- Mitigation of visual impacts associated with the construction phase, albeit temporary, would entail proper planning, management and rehabilitation of the construction site. Recommended mitigation measures include the following:

    - Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
    - Plan the placement of laydown areas and any potential temporary construction 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 area 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 in order to negate or reduce the visual impacts associated with lighting.
    - Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist must be consulted to assist or give input into rehabilitation specifications.

- During operation, the maintenance of the grid connection infrastructure will ensure that the infrastructure does not degrade, therefore aggravating visual impact.

- 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.

- Once the grid connection infrastructure has exhausted its life span, all associated infrastructure not required for the post rehabilitation use of the site/servitude should be removed and all disturbed areas appropriately rehabilitated. An ecologist should be consulted to give input into rehabilitation specifications.

- All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.

Good practice requires that the mitigation of both primary and secondary visual impacts, as listed above, be implemented and maintained on an ongoing basis.

7. CONCLUSION AND RECOMMENDATIONS

The construction and operation of the proposed grid connection infrastructure for the Zonnequa Wind Farm, may have a visual impact on the study area, especially within (but not restricted to) a 0.5km radius of the 300m corridor. The visual impact will differ amongst places, depending on the distance from the facility.

The combined visual impact or cumulative visual impact of the construction of the proposed Strandveld-Gromis double-circuit 132kV power line and the authorised (but not yet constructed) Gromis to Juno 400kV power line adjacent to each other is expected to consolidate the linear infrastructure within the region, rather than to spread it further afield.

Overall, the significance of the visual impacts is expected to range from moderate to low as a result of the generally undeveloped character of the landscape. No visual impacts of a high significance are expected to occur. The grid connection infrastructure would be visible within an area that incorporates certain sensitive visual receptors who would consider visual exposure to this type of infrastructure to be intrusive. Such visual receptors include people travelling along roads, residents of rural homesteads and settlements, and tourists passing through or holidaying in the region. See Impact Statement below.

A number of mitigation measures have been proposed (**Section 6.11.**). Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should all be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed grid connection infrastructure.

If mitigation is implemented as recommended, it is concluded that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels. As such, the grid connection infrastructure for the Zonnequa Wind Farm is considered to be acceptable from a visual impact perspective.

8. IMPACT STATEMENT

The findings of the Visual Impact Assessment undertaken for the proposed grid connection infrastructure for the Zonnequa Wind Farm indicates that the visual environment surrounding the 300m corridor, especially within a 0.5km radius, may be visually impacted upon for the anticipated operational lifespan of the double-circuit 132kV power line and collector substation.

This impact is applicable to the proposed grid connection infrastructure and to the potential cumulative visual impact of the alignment of the power line adjacent to the authorised Gromis to Juno 400kV power line. Once constructed, the 400kV power line is expected to overshadow the smaller 132kV double-circuit 132kVpower line, potentially mitigating the potential cumulative visual impacts associated with this power line.

The following is a summary of impacts remaining, assuming mitigation as recommended is exercised:

- During the construction, there may be an increase in heavy vehicles utilising the roads to the 300m corridor that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Construction activities may potentially result in a **low** temporary visual impact after mitigation.

- The grid connection infrastructure is expected to have a **low** visual impact on observers traveling along the roads and residents of homesteads within a 0.5km radius of the structures.

- The grid connection infrastructure is expected to have a **low** visual impact on observers traveling along the roads and residents of homesteads within a 0.5 - 3km radius of the structures.

- The anticipated visual impact of the proposed grid connection infrastructure on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance. This is due to the relatively low viewer incidence within close proximity to the proposed grid connection infrastructure and the presence of the existing mining activities and electricity infrastructure.

- The anticipated cumulative visual impact of the proposed grid connection infrastructure is expected to be of **moderate** significance, which is considered to be acceptable from a visual perspective. This is once again due to the relatively low viewer incidence within close proximity to the 300m corridor and the presence of the existing mining activities and electricity infrastructure.

The anticipated visual impacts listed above (i.e. post mitigation impacts) range from **moderate** to **low** significance. No visual impacts of a high significance are expected to occur. Anticipated visual impacts on sensitive visual receptors in close proximity to the 300m corridor are not considered to be fatal flaws for the proposed project.

Considering all factors, it is recommended that the development of the grid connection infrastructure as proposed be supported, subject to the implementation of the recommended mitigation measures (**Section 6.11.**) and management programme (**Section 9.**).

Where sensitive visual receptors are likely to be affected (i.e. residents of homesteads and settlements in close proximity), it is recommended that the developer enter into negotiations regarding the potential screening of visual impacts at the receptor site. This may entail the planting of vegetation, trees or the construction of screens. Ultimately, visual screening is most effective when placed at the receptor itself.

9. MANAGEMENT PROGRAMME

The following management plan tables aim to summarise the key findings of the visual impact report and suggest possible management actions in order to mitigate the potential visual impacts.

Table 7: Management Programme: Planning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the planning of the proposed grid connection infrastructure.		
Project component/s	The Strandveld-Gromis double-circuit 132kV power line and Strandveld collector substation.	
Potential Impact	Primary visual impact due to the presence of the grid connection infrastructure in the landscape.	
Activity/risk source	The viewing of the grid connection infrastructure by observers near the infrastructure as well as within the region.	
Mitigation: Target/Objective	Optimal planning of infrastructure so as to minimise visual impact.	
Mitigation: Action/control	Responsibility	Timeframe
Implement an environmentally responsive planning approach for the development of roads and infrastructure to limit cut and fill requirements. Plan with due cognisance of the topography.	Project proponent / design consultant	Planning phase.
Consolidate infrastructure and make use of already disturbed sites rather than natural areas.	Project proponent / design consultant	Planning phase.
Performance Indicator	No access roads and other associated infrastructure are visible from surrounding areas.	
Monitoring	Not applicable.	

Table 8: Management Programme: Construction.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the construction of the proposed grid connection infrastructure.		
Project component/s	Construction activities associated with the development of the double-circuit 132kV power line and collector substation	
Potential Impact	Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing.	
Activity/risk source	The viewing of general construction activities by observers near the development areas.	
Mitigation: Target/Objective	Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate works areas.	
Mitigation: Action/control	Responsibility	Timeframe
Ensure that vegetation is not unnecessarily cleared or removed during the construction period.	Project proponent / contractor	Early in the construction phase.
Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Project proponent / contractor	Early in and throughout the construction phase.
Restrict the activities and movement of construction workers and vehicles to the immediate construction area and existing access roads.	Project proponent / contractor	Throughout the construction phase.
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Project proponent / contractor	Throughout the construction phase.
Reduce and control construction dust through the use of approved dust	Project proponent / contractor	Throughout the construction phase.

suppression techniques as and when required (i.e. whenever dust becomes apparent).		
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Project proponent / contractor	Throughout the construction phase.
Rehabilitate all disturbed areas, construction areas, servitudes etc. immediately after the completion of construction works. If necessary, consult an ecologist to give input into rehabilitation specifications.	Project proponent / contractor	Throughout and at the end of the construction phase.
Performance Indicator	Vegetation cover within the servitudes and in the vicinity of the grid connection infrastructure is intact with no evidence of degradation or erosion.	
Monitoring	Monitoring of vegetation clearing during construction. Monitoring of rehabilitated areas post construction.	

Table 9: Management Programme: Operation.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the operation of the proposed grid connection infrastructure.		
Project component/s	The Strandveld-Gromis double-circuit 132kV power line and Strandveld collector substation.	
Potential Impact	Visual impact of vegetation rehabilitation failure.	
Activity/risk source	The viewing of the above mentioned by observers near the infrastructure.	
Mitigation: Target/Objective	Well-rehabilitated and maintained servitudes.	
Mitigation: Action/control	Responsibility	Timeframe
Maintain roads to forego erosion and to suppress dust.	Project proponent / operator	Throughout the operation phase.
Monitor rehabilitated areas, and implement remedial action as and when required.	Project proponent / operator	Throughout the operation phase.
Performance Indicator	Intact vegetation within servitudes and in the vicinity of the infrastructure.	
Monitoring	Monitoring of rehabilitated areas.	

Table 10: Management Programme: Decommissioning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the decommissioning of the proposed grid connection infrastructure.		
Project component/s	The Strandveld-Gromis double-circuit 132kV power line and Strandveld collector substation.	
Potential Impact	Visual impact of residual visual scarring and vegetation rehabilitation failure.	
Activity/risk source	The viewing of the residual scarring and vegetation rehabilitation failure by observers along or near the areas where the grid connection infrastructure was constructed.	
Mitigation: Target/Objective	Rehabilitated vegetation in all disturbed areas.	
Mitigation: Action/control	Responsibility	Timeframe
Remove infrastructure not required for the post-decommissioning use of the site/servitude.	Project proponent / operator	During the decommissioning phase.
Rehabilitate access roads and servitudes not required for the post-decommissioning	Project proponent / operator	During the decommissioning phase.

use of the sites. If necessary, consult an ecologist to give input into rehabilitation specifications.		
Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.	Project proponent / operator	Post decommissioning.

Performance Indicator	Intact vegetation along and in the vicinity of the servitude.
Monitoring	If rehabilitation is successful then no further monitoring is required.

11. REFERENCES/DATA SOURCES

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