PROPOSED MARALLA 132kV TRANSMISSION INTEGRATION PROJECT

Western and Northern Cape Provinces

VISUAL IMPACT ASSESSMENT

Produced for:

Biotherm Energy (Pty) Ltd

On behalf of:

WSP Group Africa (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).

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.

WSP Group Africa (Pty) Ltd appointed Lourens du Plessis as an independent specialist consultant to undertake the visual impact assessment for the Proposed Maralla 132kV Transmission Integration Project. 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 project area (and the larger 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 Geographical Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed infrastructure. A detailed Digital Terrain Model (DTM) for the study area was created from topographical data provided by the Japan Aerospace Exploration Agency (JAXA), Earth Observation Research Centre, in the form of the ALOS Global Digital Surface Model "ALOS World 3D - 30m" (AW3D30) elevation model.

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 Maralla 132kV Transmission Integration Project.

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 infrastructure 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 infrastructure 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 determine 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 (July 2021) 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

BioTherm Energy (Pty) Ltd (BioTherm) is proposing the establishment of transmission integration infrastructure for their proposed Maralla Wind Energy Facilities (WEFs) in the Northern and Western Cape. The two Maralla facilities (Maralla West and Maralla East) will each have a maximum generation capacity of 140MW (250MW in previous revisions of plan) and are two of three wind energy projects being proposed by BioTherm in the greater area. These projects include: Esizayo, Maralla West and Maralla East.

The Maralla WEF sites lie within the Moordenaars Karoo in the Northern and Western Cape, in the Karoo Hoogland and Lainsburg Local Municipalities. They are situated approximately 46km (at the closest) north of the N1, 34km south of the town of Sutherland and 20km east of the R354 arterial road, which runs between Matjiesfontein and Sutherland (see **Figure 1**).

This is the second transmission integration project undertaken for the Maralla WEFs. A previous study was undertaken in 2017 where two collector substation and power line alternatives where assessed in order to connect the Maralla WEFs with the national grid via the existing Eskom Komsberg Main Transmission Substation (MTS). The outcome of this project favoured the Substation 1 and Route Alternative 1 option that has subsequently been authorised.

In order to further strengthen their grid integration options, Biotherm has opted to undertake an additional transmission integration project whereby the Maralla WEFs will be connected to the authorised Hidden Valley WEF substation. This substation will be located within the Karuso WEF phase of the three collective Hidden Valley WEFs. The other two phases are called the Soetwater and Great Karoo WEFs.

The proposed additional transmission strengthening options (addressed in this report) include six alternatives, namely: Options 1 (A), 1 (B), 2 (A), 4, A Line and B Line.

Option 1 (A) (17.5km)

This alternative will traverse southwards from the Maralla substation alongside the Komsberg/Kareedoringkraal secondary road for 7.5km, crossing an unnamed drainage line before veering west towards the Klein-Roggeveldberge. It turns southwards near the escarpment, west of the Perdekraal se Berg, before entering the Hidden Valley substation.

Option 1 (B) (19km)

This alternative will traverse southwards from the Maralla substation alongside the Komsberg/Kareedoringkraal secondary road for approximately 10km. It crosses an unnamed drainage line, the Perdeplaas se Berg ridgeline and the Meintjiesplaas River before veering west towards the Hidden Valley substation.

Option 2 (A) (15.4km)

This is the shortest alternative and it traverses west from the Maralla substation towards the Klein-Roggeveldberge. It continues in a south-westerly direction past the Heuwels substation and alongside the authorised Heuwels-Hidden Valley power lines to the Hidden valley substation.

Option 4 (20km)

This alternative will traverse southwards from the Maralla substation alongside the Komsberg/Kareedoringkraal secondary road for 5km before veering west towards the Klein-Roggeveldberge. It turns southwards near the escarpment and continues south to the Hidden Valley substation.

Option A Line (16km)

This alternative traverses west from the Maralla substation towards the Klein-Roggeveldberge. It continues in a south-westerly direction past the Heuwels substation and alongside the authorised Heuwels-Hidden Valley power lines to the Hidden Valley substation.

Option B Line (16km)

This alternative traverses west from the Maralla substation towards the Klein-Roggeveldberge. It continues in a south-westerly direction past the Heuwels substation and alongside the authorised Heuwels-Hidden Valley power lines to the Hidden Valley substation.

The transmission line options will traverse the following farms or farm portions:

- Drie Roode Heuvels 180 (C07200000000018000000)
- Orangie Fontein 203 (C07200000000020300000)
- Orangie Fontein 203 Portion 2 (C07200000000020300002)
- Orangie Fontein 203 Portion 1 (C07200000000020300001)
- Kentucky 206 (C07200000000020600000)
- De Hoop 202 (C07200000000020200000)

These farms are situated within the Gazetted Central Electricity Grid Infrastructure (EGI) Corridor, one of five corridors earmarked for electricity infrastructure development within South Africa. The project also falls within the Komsberg Renewable Energy Development Zone (REDZ), one of the eight areas that have been identified through an extensive process for the development of renewable energy installations.

The National Environmental Management Act (NEMA) and Environmental Impact Assessment (EIA) Regulations require that a Basic Assessment (BA) be undertaken for the proposed power line infrastructure, since it includes listed activities in terms of these regulations. A separate assessment is being conducted for the Esizayo 132kV Transmission Integration Project.

The power line towers will either be steel lattice or monopole structures with a maximum height up to 36m above ground level. The servitude generally associated with 132kV power lines will be up to 40m wide and it is expected that the construction phase will be up to 24 months long.

The proposed grid connection infrastructure is indicated on the maps displayed within this report. Sample images of lattice and monopole tower structures are displayed below.

Figure 1: Regional locality of the study area.

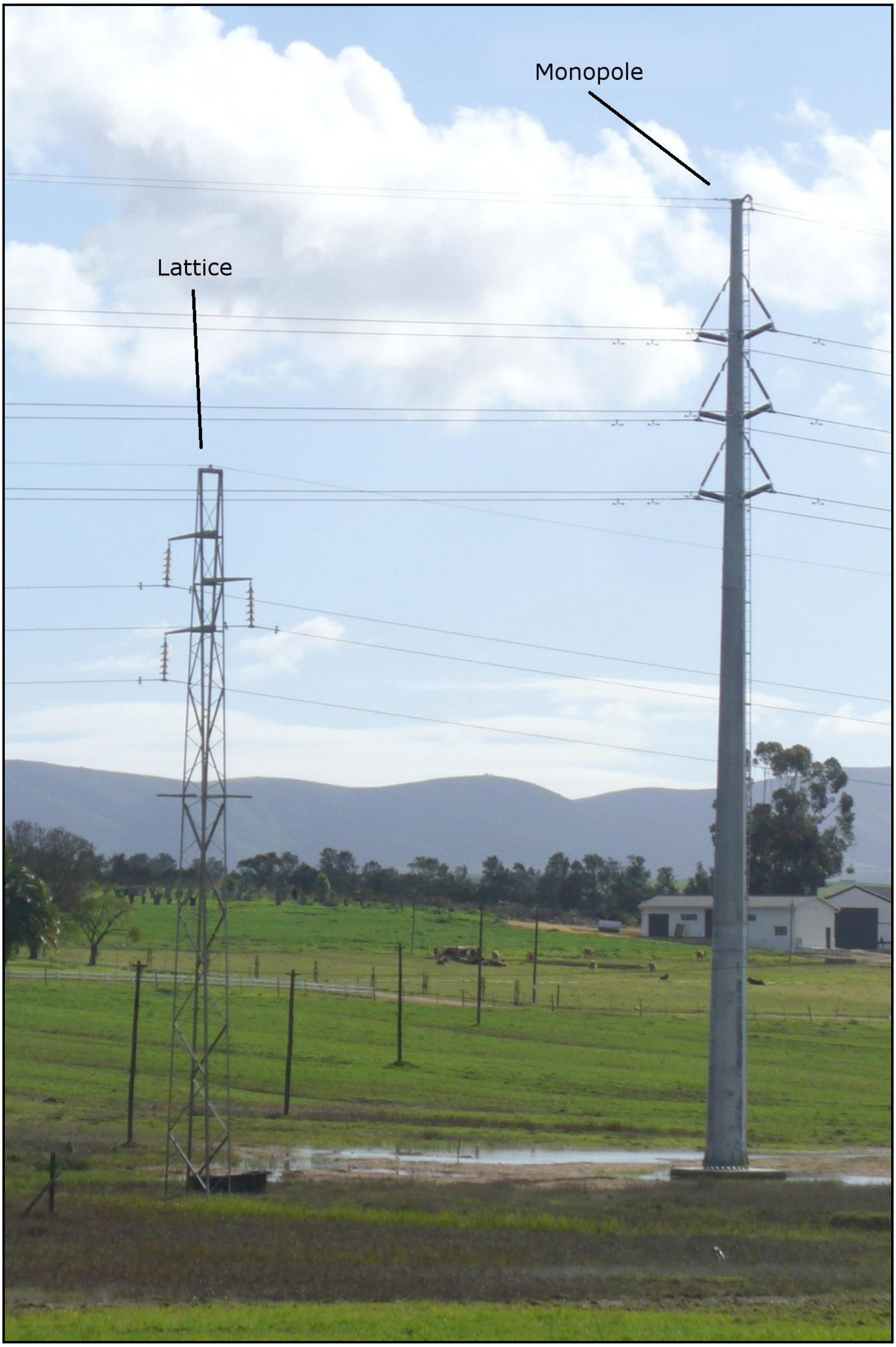

Figure 2: Conventional lattice power line tower compared to a steel monopole structure.

Figure 3: Longer distance view of power line towers.

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 the nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure.

The study area for the visual impact assessment encompasses a geographical area of 450km² (the extent of the full page maps displayed in this report) and includes a minimum 3km buffer zone (area of potential visual influence) from the power line alignments.

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

- The visibility of the infrastructure to, and potential visual impact on, observers travelling along the secondary roads within the study area.
- The visibility of the infrastructure to, and potential visual impact on residents of homesteads within the study area.
- The potential visual impact of the infrastructure on the visual character or sense of place of the region.
- The potential visual impact of the infrastructure on tourist routes or tourist destinations (if present).
- The visual absorption capacity of the natural vegetation (if applicable).
- Potential cumulative visual impacts (or consolidation of visual impacts), with specific reference to the location of the proposed infrastructure within

the Komsberg REDZ, the Central Power Corridor and within close proximity to authorized WEF infrastructure.

- Potential visual impacts associated with the construction phase.

- 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 potentially at a 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

The proposed Maralla 132kV Transmission Integration Project lie within the Moordenaars (Murderer's) Karoo; a dry, barren and desolate region south of the Great Escarpment, approximately 46km (at the closest) north of Lainsburg. Even though the Maralla East and West WEFs span across two provinces (i.e. the Western and Northern Cape Provinces) the proposed grid infrastructure alternatives all fall within the Northern Cape Province, and more specifically within the Karoo Hoogland Local Municipality. The Moordenaars Karoo does not include any major towns or settlements and is very remote. The project site is only accessible via a secondary dirt road (Komsberg/Kareedoringkraal road) that veers off from the R354 arterial road, traversing between Matjiesfontein and Sutherland.

Topography, hydrology and vegetation

The study area is situated on land that ranges in elevation from approximately 845m (in the north-west of the study area) to 1,549m at the top of the Komsberge to the north-east. The proposed project infrastructure will be located on the Klein-Roggeveld *plateau*, which is flanked by the Klein-Roggeveldberge to the west of the *plateau*. These mountains form the western escarpment of the *plateau,* which includes a landscape consisting of three sets of distinct undulating plains separated (and surrounded) by tall hills or ridges. Some of these include:

- Perdeplaas se Berg
- Ruiter se Kop
- Langberge
- Graskop

There are no perennial rivers in the study area, with only a few weakly defined non-perennial or seasonal water courses appearing within this arid region (*Karoo Renosterveld Bioregion*). These include the Meintjiesplaas, Komsberg and Venters Rivers. These rivers are all tributaries of the Buffels River that ultimately flows past Lainsburg. There are a limited number of farm dams on the *plateau* which receives a mean annual rainfall of 290mm.

The vegetation cover on the *plateau* is predominantly *Central Mountain Shale Renosterveld* and *Koedoesberge-Moordenaars Karoo*, with *Tanqua Escarpment Shrubland* along the western slopes of the Klein-Roggeveldberge. The land cover types are low shrubland (Fynbos) for most of the study area, with bare sand and rock surfaces primarily associated with the mountainous terrain. It should be noted that the vegetation cover in the region e.g. bare sand and rock surfaces can change according to the season and the amount of rainfall.

Refer to **Maps 1**, **2** and **3** for the shaded relief, topography and land cover maps of the study area.

Land use and settlement patterns

The majority of the study area is sparsely populated with a population density of less than 1 person per km^2. The study area consists of a landscape that can be described as remote due to its considerable distance from any major metropolitan centres or populated areas. The scarcity of water and other natural resources has influenced settlement within this region, keeping numbers low, and distribution limited to the availability of water. Settlements, where they occur, are usually rural homesteads and farmsteads.

Very few homesteads and settlements are present within the study area. These include:

- Damslaagte
- De Hoop
- De Plaat
- Oranjefontein
- De Kom
- Welgemoed

It is uncertain whether all of these farmsteads are inhabited or not. It stands to reason that farmsteads that are not currently inhabited will not be visually impacted upon at present. These farmsteads do, however retain the potential to be affected visually should they ever become inhabited again in the future. For this reason, the author of this document operates under the assumption that they are all inhabited.

The predominant land use in the area is stock farming (predominantly sheep, game or goat farming). Since rainfall is low and water is scarce, crop farming accounts for only a small portion of the land use and is largely confined to the more fertile valleys. Due to the low carrying capacity, farms are large and usually at least about 5km apart.

The R354 arterial road provides motorised access to the region from the N1 national road near Matjiesfontein, the quaint historical town closest to the site (approximately 36km by road to the Komsberg/Kareedoringkraal secondary road). This road (the R354) is a local tourism route ultimately leading to Sutherland, the home of the Southern African Large Telescope (SALT). This town and Matjiesfontein are considered to be local tourist attractions/destinations within the region.

Besides the two towns mentioned above, there are no other identified tourist attractions of designated protected areas within the study area.[2]

In spite of the rural and natural character of the study area, there are a number existing overhead power lines in the study area. These include:

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[2] Sources: DEAT (ENPAT Northern and Western Cape), Gebhardt (2017), NBI (Vegetation Map of South Africa, Lesotho and Swaziland), NLC2018 (ARC/CSIR), REEA_OR_2021_Q1 and SAPAD2021 (DFFE).

- Droërivier-Kappa (Komsberg) 1 400kV
- Droërivier-Kappa (Komsberg) 2 400kV
- Gamma-Kappa 1 765kV
- Laingsburg-Roggeveld 1 66kV

The former three power lines cross the study area to the south-east and the latter to the north-east (at the Roggeveld Substation).

There are also a number of future power lines and substations that have been authorised and surveyed, but not yet constructed. Of relevance to this study are the Heuwels-Hidden Valley and Hidden Valley-Komsberg power lines and substations. These power lines are indicated on the maps in this report.

Further to this, the proposed Maralla WEF grid connection infrastructure is located within the Komsberg Renewable Energy Development Zone (REDZ) and Central Strategic Transmission Corridor. Refer to **Figure 5** for the regional locality of the site in relation to the Komsberg REDZ. REDZ are described as:

"areas where large scale wind and solar PV energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the environment, while yielding the highest possible socio-economic benefits to the country."

Source: https://redzs.csir.co.za

Figure 5 further indicates the status of Renewable Energy Environmental Applications (REEA) within the Komsberg REDZ (dated 2021 1st quarter).

Applications that have been approved (additional to the Maralla East and West WEFs) in the study area include:

- Rietrug WEF
- Hidden Valley WEF (Karusa, Great Karoo & Soetwater)
- Roggeveld WEF
- Gunstfontein WEF
- Komsberg WEF
- Esizayo WEF
- Karreebosch WEF
- Sutherland WEF

Note: Some of these applications include more than one phase.

It is clear that the region will come under increasing development pressure, and visual intrusion from WEF infrastructure, should all (or most) of the proposed WEFs be constructed.

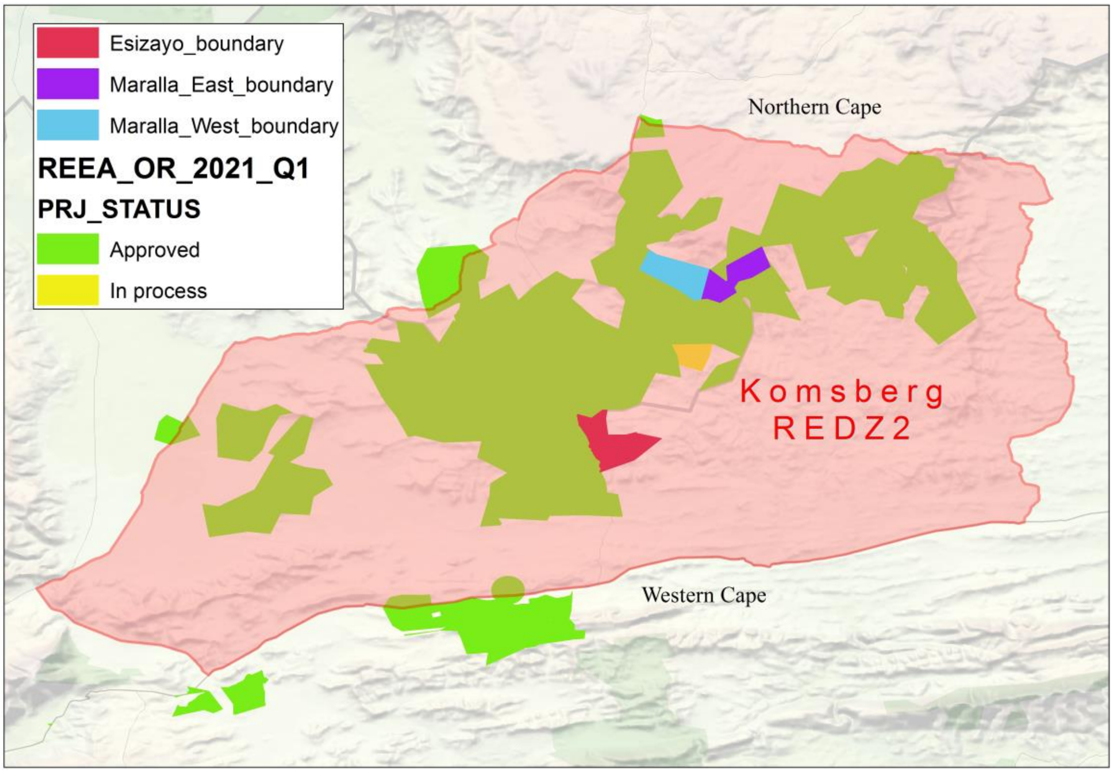


Figure 4: Regional locality of the Maralla WEFs in relation to the Komsberg Renewable Energy Development Zone (REDZ).

*Note: The data above (**Figure 5**) is provided by the Department: Forestry, Fisheries and the Environment (DFFE). The author accepts no responsibility for the accuracy thereof.*

The photographs below aid in describing the general environment within the study area and surrounding the proposed project infrastructure.

Figure 5: View along the R354 arterial road looking north towards the Great Escarpment and Sutherland.

Figure 6: The Klein-Roggeveldberge as seen from the R354.

Figure 7: Typical dry riverbed within the study area.

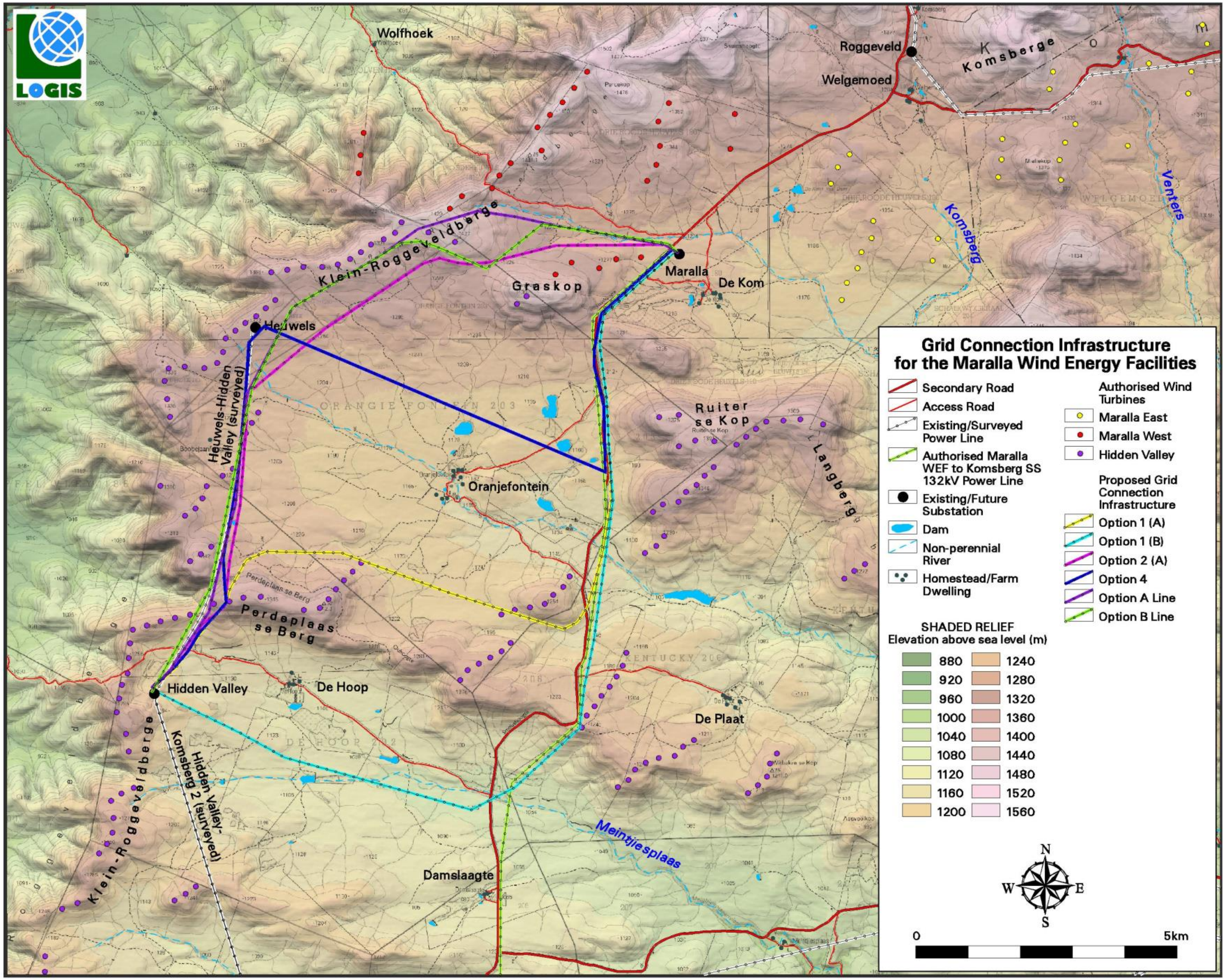
Figure 8: The Komsberg/Kareedoringkraal secondary road near Damslaagte.

Figure 9: Existing power lines in the study area.

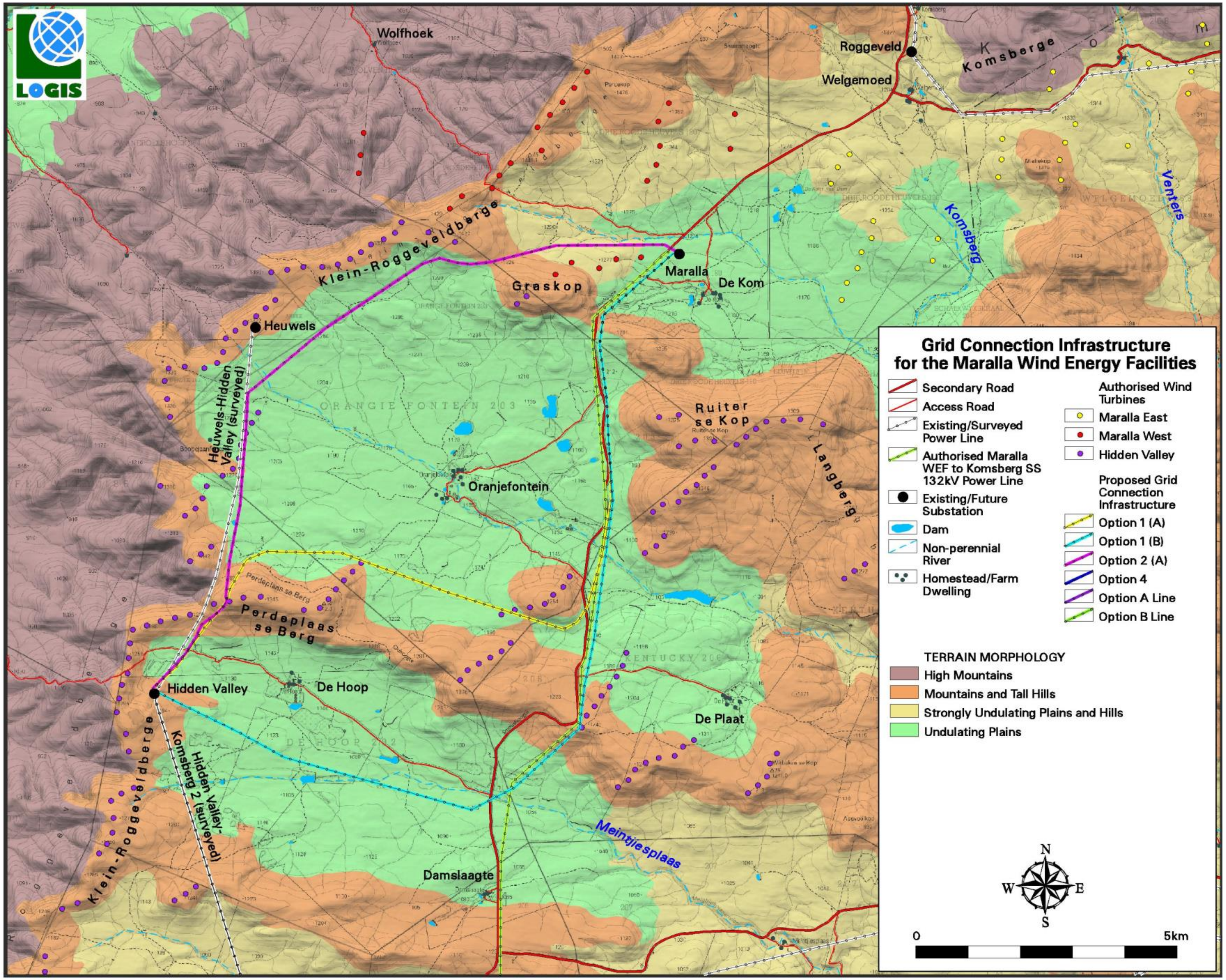
Figure 10: Low shrubland in the study area.

Figure 11: Wide open expanse of the study area.

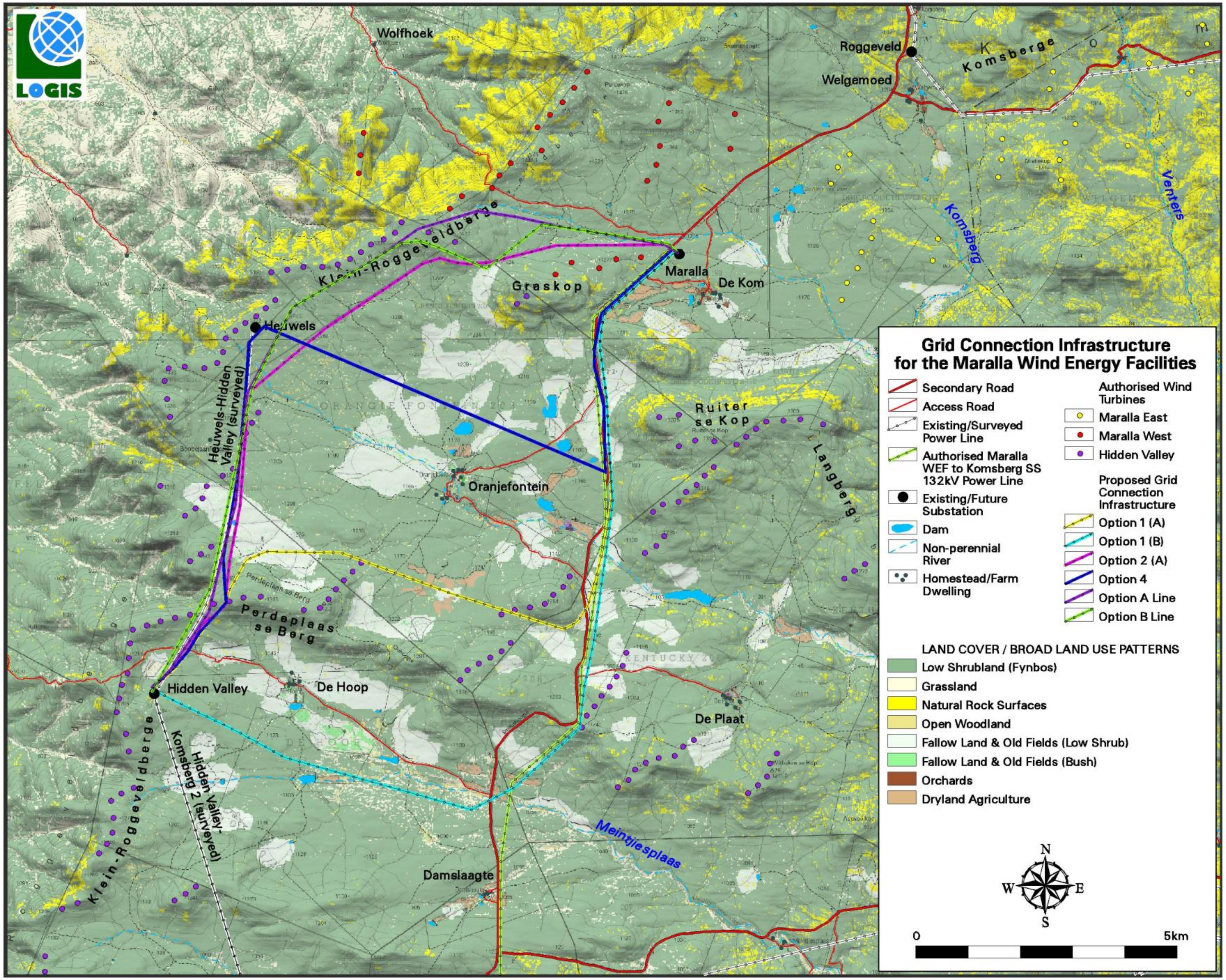
Figure 12: A typical Karoo farmstead/homestead.



Map 1: Shaded relief map of the study area.



Map 2: Terrain morphology.



Map 3: Land cover and broad land use patterns.

6. RESULTS

6.1. Potential visual exposure

The potential visual exposure (visibility) of the grid connection infrastructure is shown on **Maps 4** to **9**. The visibility analyses were undertaken from the proposed Maralla WEF collector substation, along each of the power line alternatives (up to the Hidden Valley substation site) at an offset of 36m above average ground level (i.e. the approximate height of the grid connection infrastructure), for a distance of 3km from the infrastructure. The viewshed analyses were 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 (i.e. a 132kV power line).

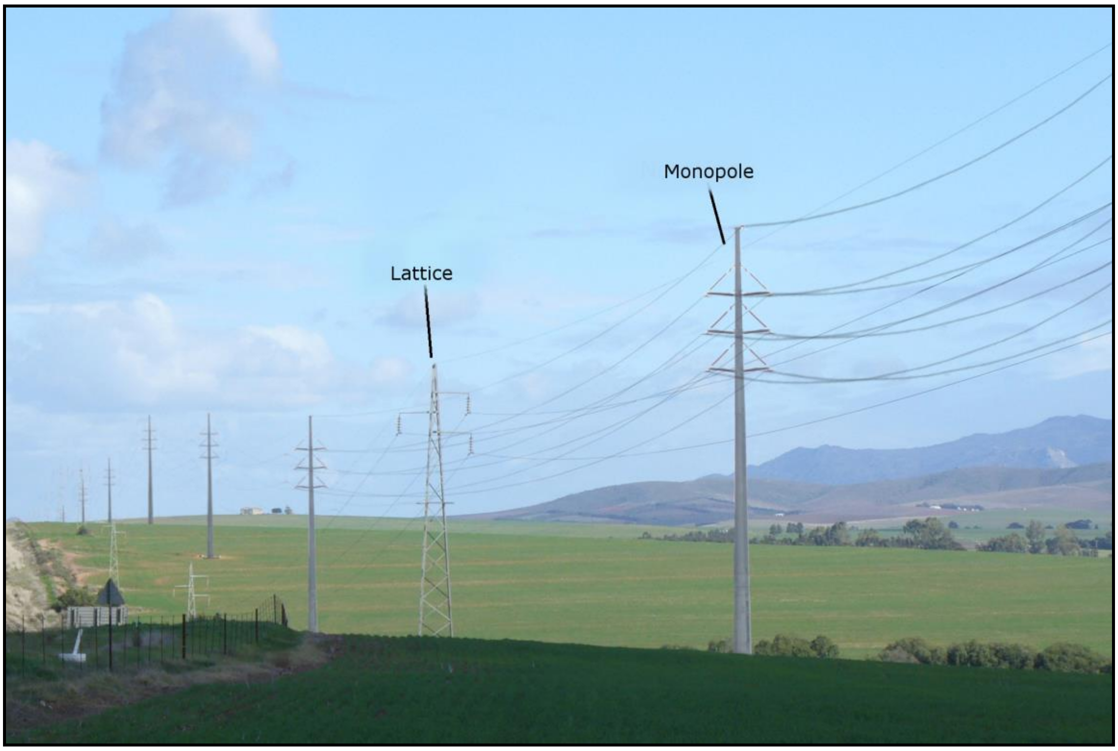


Figure 13: Examples of 132kV overhead power lines.

It is expected that the grid connection infrastructure may theoretically be visible within their respective 3km visual corridors and potentially highly visible within a 0.5 – 1.5km radius of the structures due to the generally flat terrain it traverses. Beyond 1.5km the visibility becomes more scattered due to the undulating nature of the topography as well as the presence of hills and ridges. The grid connection structures are unlikely to be visible beyond a 3km radius of the structures.

Although the majority of the exposed areas fall within vacant open space, generally devoid of observers or potential sensitive visual receptors, specific receptors sites are discussed per alternative below.

Option 1 (A) (17.5km)

This alternative is expected to be highly visible from the Komsberg/-Kareedoringkraal secondary road for 7.5km. It may be visible from the De Kom homestead from a distance of 1km and from the Oranjefontein homestead from approximately 2km. South of the Perdekraal se Berg and closer to the Hidden Valley substation it may be visible from the De Hoop homestead.

Option 1 (B) (19km)

This alternative is expected to be highly visible from the Komsberg/-Kareedoringkraal secondary road for approximately 10km. It may be visible from the De Kom homestead from a distance of 1km and from the De Plaat homestead from almost 3km. South of the Perdekraal se Berg ridge it may be visible from the Damslaagte homestead from just over 1.5km and the De Hoop homestead from approximately 1.3km.

Option 2 (A) (15.4km)

Option 2 (A) may briefly be visible from the Komsberg/Kareedoringkraal secondary road where the line crosses the road near the Maralla WEF substation. It may similarly be visible from the De Kom homestead at a distance of 1km, but would unlikely be visible from any additional dwellings until it traverses over Perdekraal se Berg, where it may be visible from the De Hoop homestead from almost 2km.

Option 4 (20km)

This alternative is expected to be highly visible from the Komsberg/-Kareedoringkraal secondary road for 5km. It may be visible from the De Kom homestead from a distance of 1km and from the Oranjefontein homestead from approximately 1km. South of the Perdekraal se Berg and closer to the Hidden Valley substation it may be visible from the De Hoop homestead.

Option A Line (16km)

Option A Line may briefly be visible from the Komsberg/Kareedoringkraal secondary road where the line crosses the road near the Maralla WEF substation. It may similarly be visible from the De Kom homestead at a distance of 1km, but would unlikely be visible from any additional dwellings until it traverses over Perdekraal se Berg, where it may be visible from the De Hoop homestead from almost 2km.

Option B Line (16km)

Option B Line may briefly be visible from the Komsberg/Kareedoringkraal secondary road where the line crosses the road near the Maralla WEF substation. It may similarly be visible from the De Kom homestead at a distance of 1km, but would unlikely be visible from any additional dwellings until it traverses over Perdekraal se Berg, where it may be visible from the De Hoop homestead from almost 2km.

Conclusion

In general terms it is envisaged that the grid connection infrastructure, where visible from shorter distances (e.g. less than 1.5km), and where sensitive visual receptors may find themselves within this zone, may constitute a high visual prominence, potentially resulting in a visual impact. The incidence rate of sensitive visual receptors is however expected to be quite low, due to the generally remote location of the proposed infrastructure and the low number of potential observers.

Additional to the statement above, all of the receptor sites (homesteads) mentioned above is associated with either the Hidden Valley or Maralla WEFs; potentially negating the receptor's sensitivity to the grid line infrastructure (i.e. they are assumed to be supportive of the projects).

The **Option 2 (A), Option A Line** and **Option B Line** alignments have the greatest opportunity to remove the potential visual exposure away from the Komsberg/Kareedoringkraal secondary road, as well as to consolidate the linear infrastructure within the region e.g. it will traverse adjacent to the authorised (surveyed) Heuwels-Hidden Valley power line for 6km. Option 2 (A) is the shortest alignment and is therefore the preferred alternative, although any of these three alternatives could be selected as preferred.

6.2. Potential cumulative visual exposure

Cumulative visual impacts can be defined as the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments. In this case the 'development' would be a new 132kV power line located within an area earmarked for future WEF infrastructure.

Cumulative visual impacts may be:

- Combined, where several power lines are within the observer's arc of vision at the same time;
- Successive, where the observer has to turn his or her head to see the various structures of a power line; and
- Sequential, when the observer has to move to another viewpoint to see different power line structures, or different views of the same power line (such as when travelling along a route).

The visual impact assessor is required (by the competent authority) to identify and quantify the cumulative visual impacts and to propose potential mitigating measures. This is often problematic as most regulatory bodies do not have specific rules, regulations or standards for completing a cumulative visual assessment, nor do they offer meaningful guidance regarding appropriate assessment methods. There are also not any authoritative thresholds or restrictions related to the capacity of certain landscapes to absorb the cumulative visual impacts of the power line infrastructure.

To complicate matters even further, cumulative visual impact is not just the sum of the impacts of two developments. The combined effect of both may be much greater than the sum of the two individual effects, or even less.

The cumulative impact of the proposed grid connection infrastructure on the landscape and visual amenity is a product of:

- The distance between the power lines;
- The distance over which the structures are visible;
- The overall character of the landscape and its sensitivity to the structures;
- The siting and design of the power line; and
- The way in which the landscape is experienced.

The specialist is required to conclude if the proposed 'development' will result in any unacceptable loss of visual resource considering the industrial infrastructure proposed in the area.

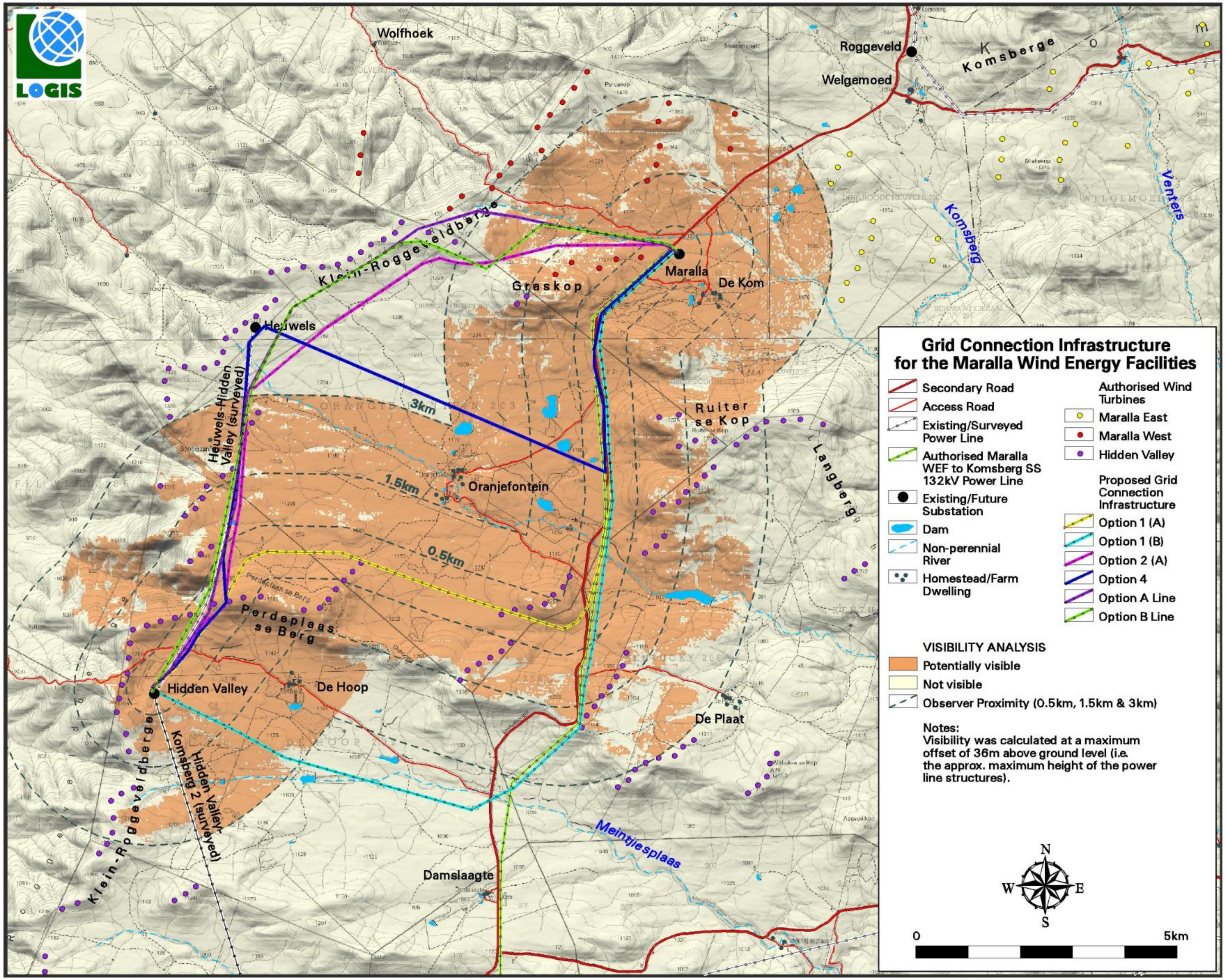
Results

The area of visual influence for the proposed 132kV power line is expected to be largely transformed by the appearance of much larger wind turbine structures, once constructed. It is expected that the much larger wind turbines would overshadow most of the power line infrastructure as proposed. This does not only apply to the Maralla and Hidden Valley WEFs, but also to the other authorised WEF applications within the region. Refer to **Section 5** of this report for the applications according to the South African Renewable Energy EIA Application Database (REEA_OR_2021_Q1).

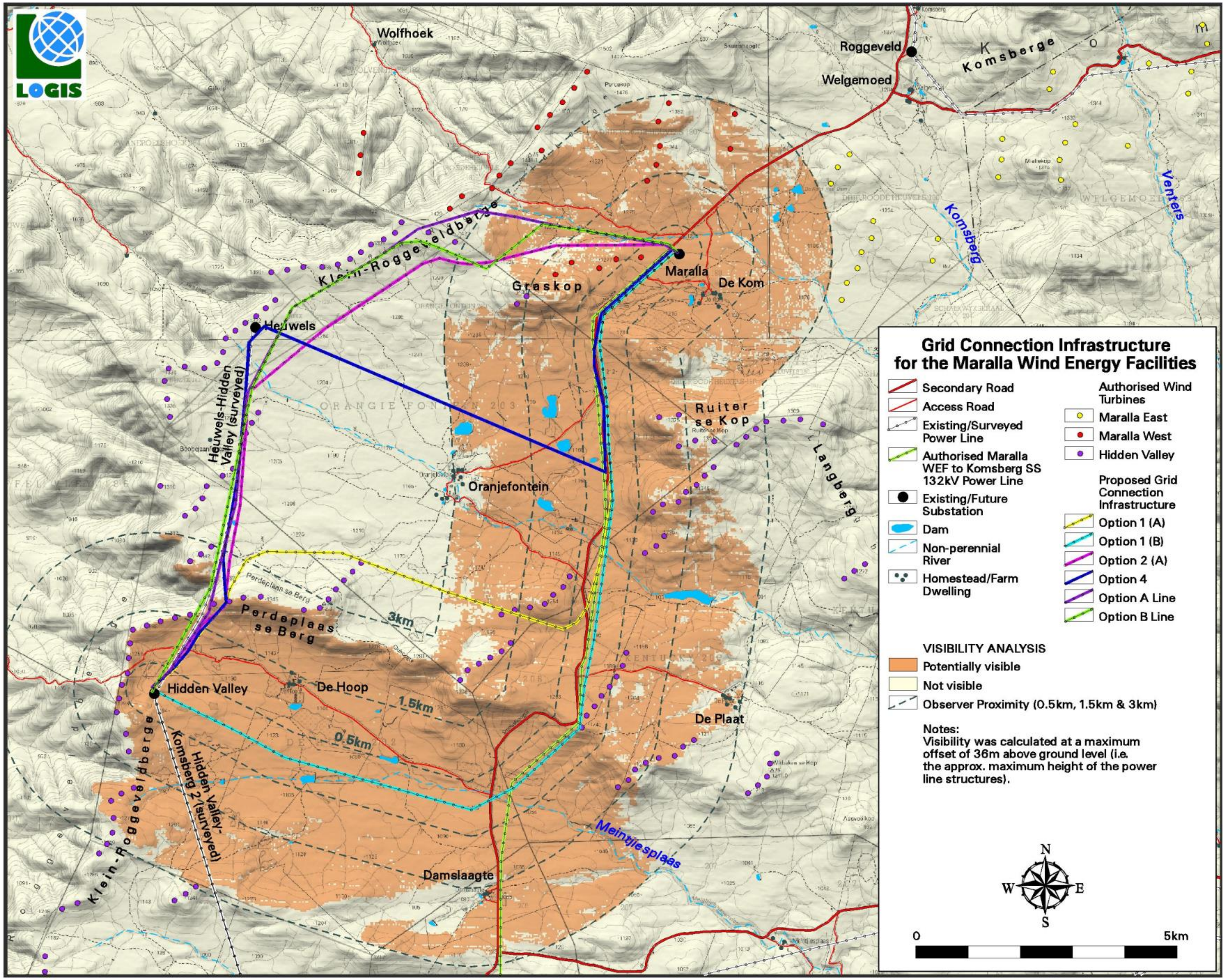
It must be noted that the database is not always updated regularly and therefore some projects may no longer be considered for development, or no longer have valid Environmental Authorisations (EAs). The data is displayed as provided and the author does not accept responsibility for the accuracy thereof.

Conclusion

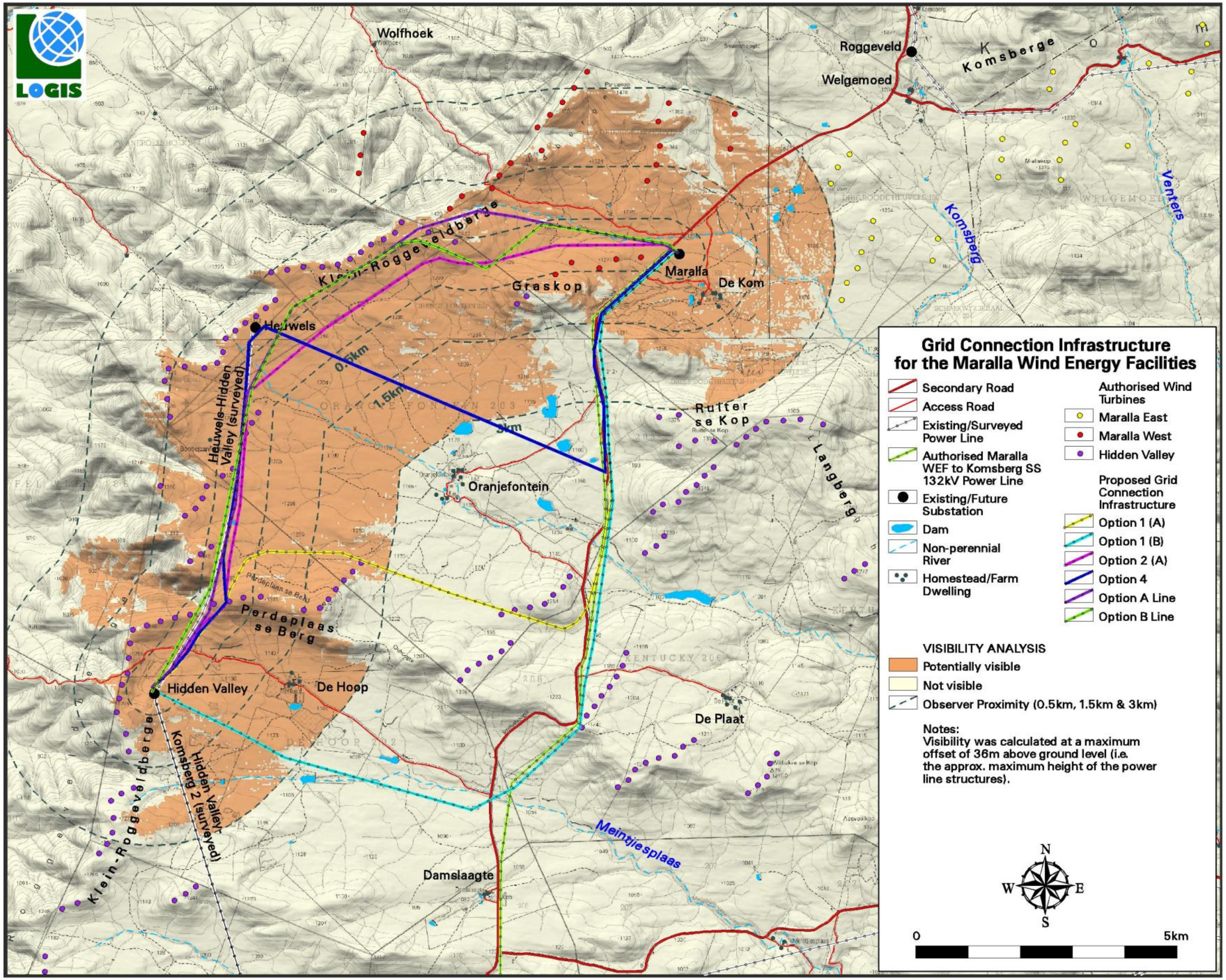
The large number of approved renewable energy generation applications within the Komsberg REDZ and this area in particular, is expected to increase the cumulative visual impact should all of these projects be constructed, both for the primary project components and for the ancillary components (i.e. grid connection infrastructure). However, considering the purpose of the establishment of the Komsberg REDZ (i.e. to concentrate renewable energy applications within this area) the cumulative visual impact is considered to be within acceptable limits. It is further recommended that proposed future developments should be contained within this zone, rather than be located further afield and ultimately spreading the visual impacts over larger areas.



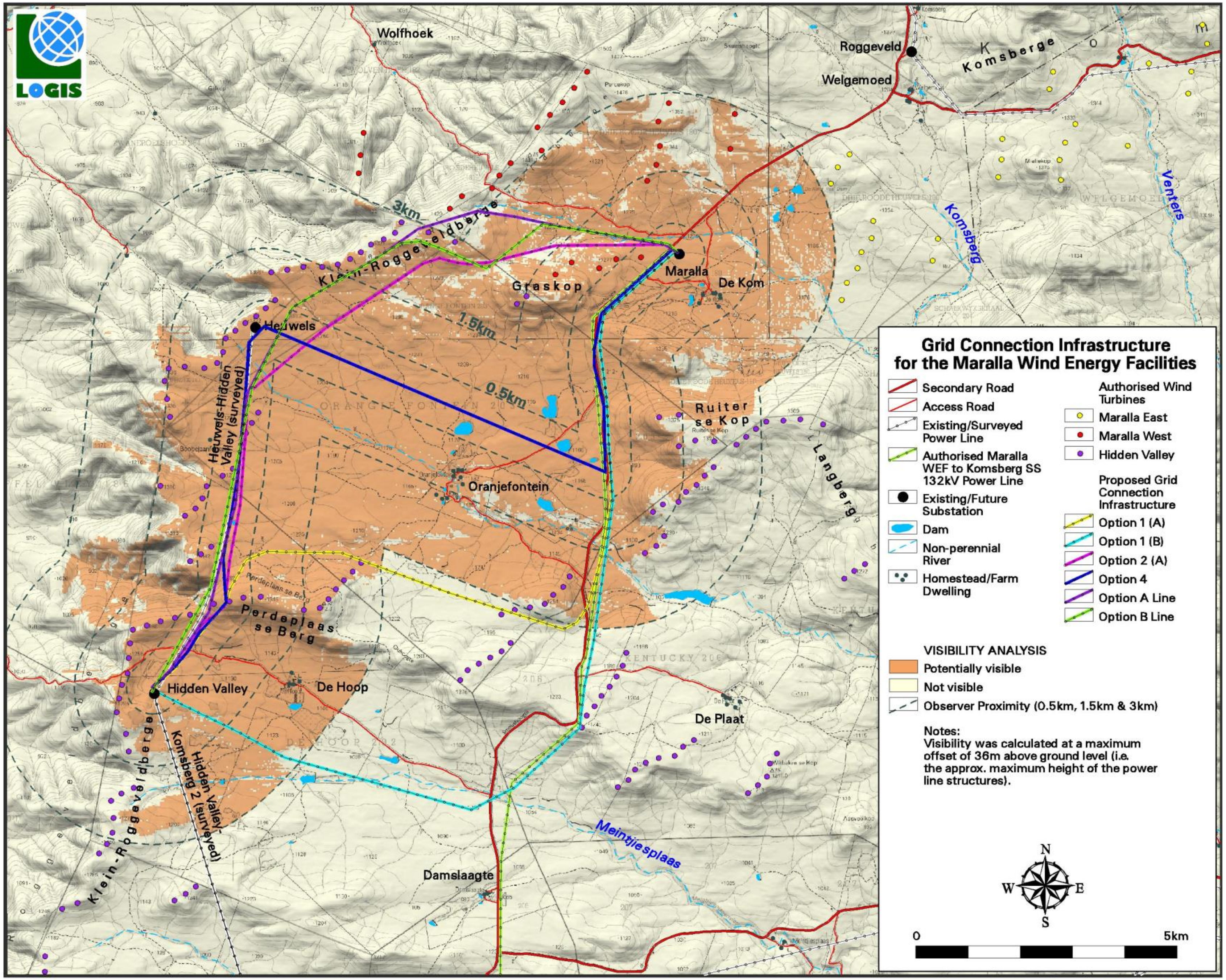
Map 4: Viewshed analysis: Option 1 (A).



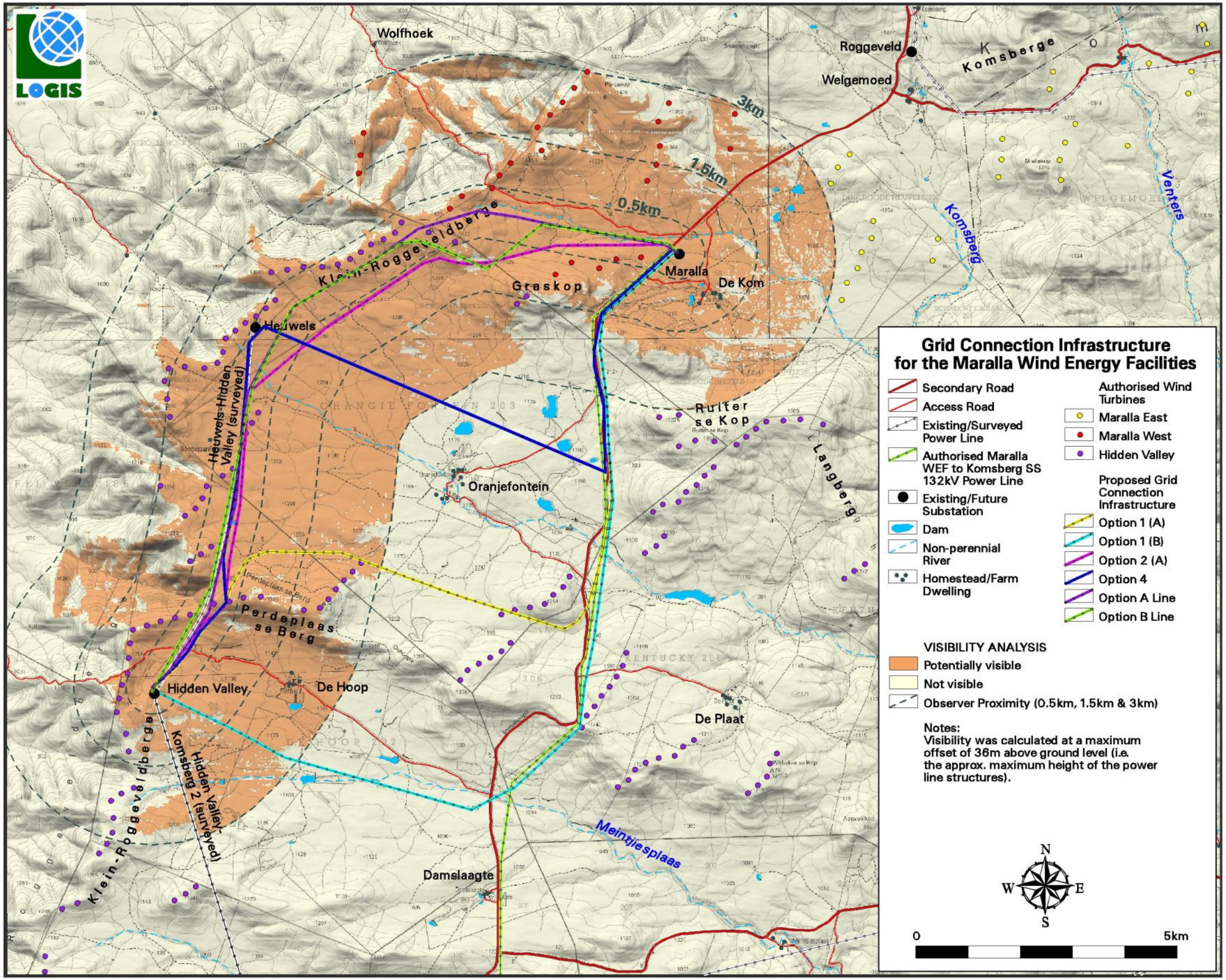
Map 5: Viewshed analysis: Option 1 (B).



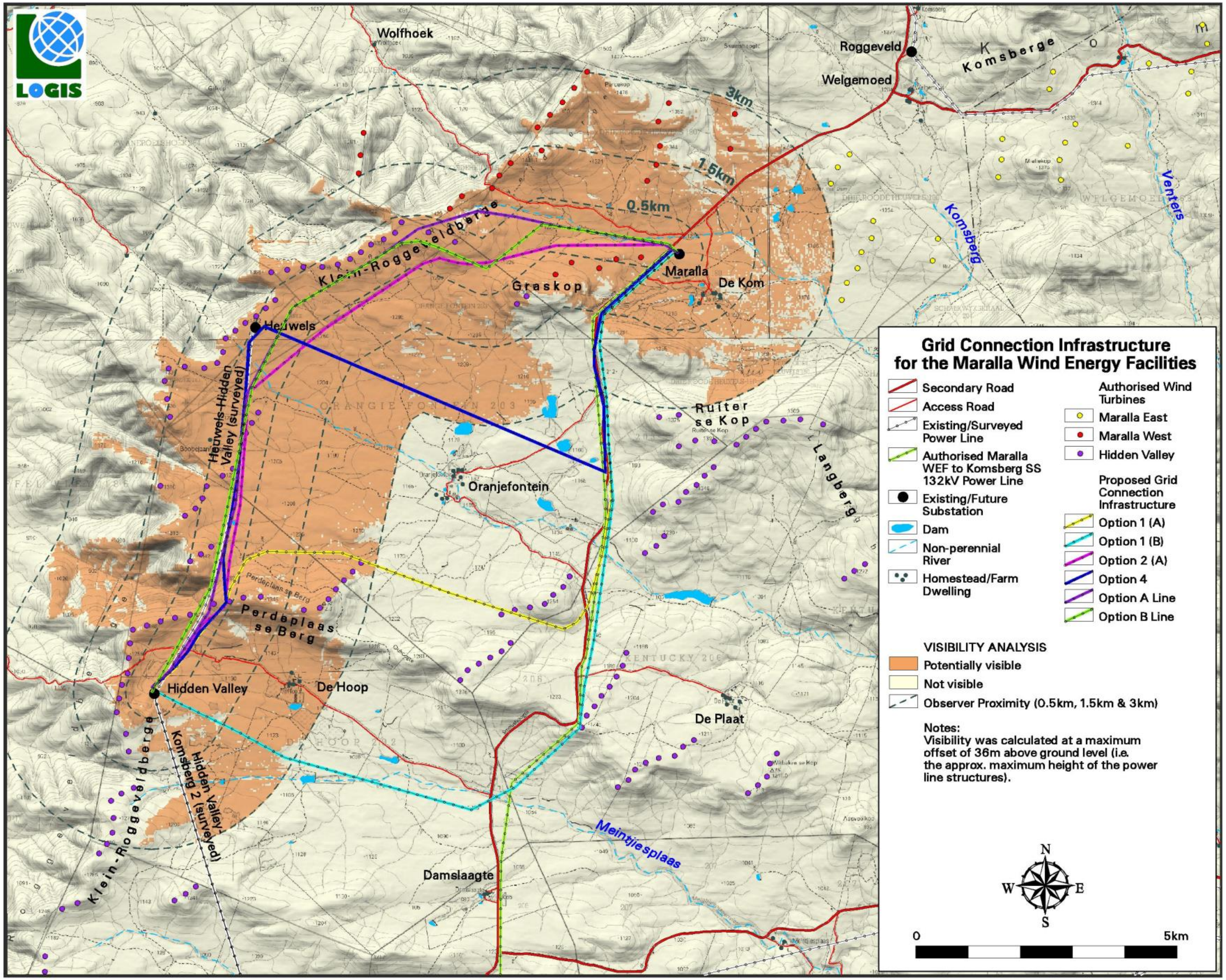
Map 6: Viewshed analysis: Option 2 (A).



Map 7: Viewshed analysis: Option 4.



Map 8: Viewshed analysis: Option A Line.



Map 9: Viewshed analysis: Option B 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 grid connection infrastructure (e.g. 400kV) and downwards for smaller structures (e.g. 132kV) due to variations in height. This methodology was developed in the absence of any known and/or accepted standards for South African power line infrastructure.

The proximity radii (calculated from the grid connection infrastructure) are indicated on **Map 10**, and include the following:

- 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 lines.

The visual distance theory and the observer's proximity to the 132kV power line and substation extension are closely related, and especially relevant, when considered from areas with a higher 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.

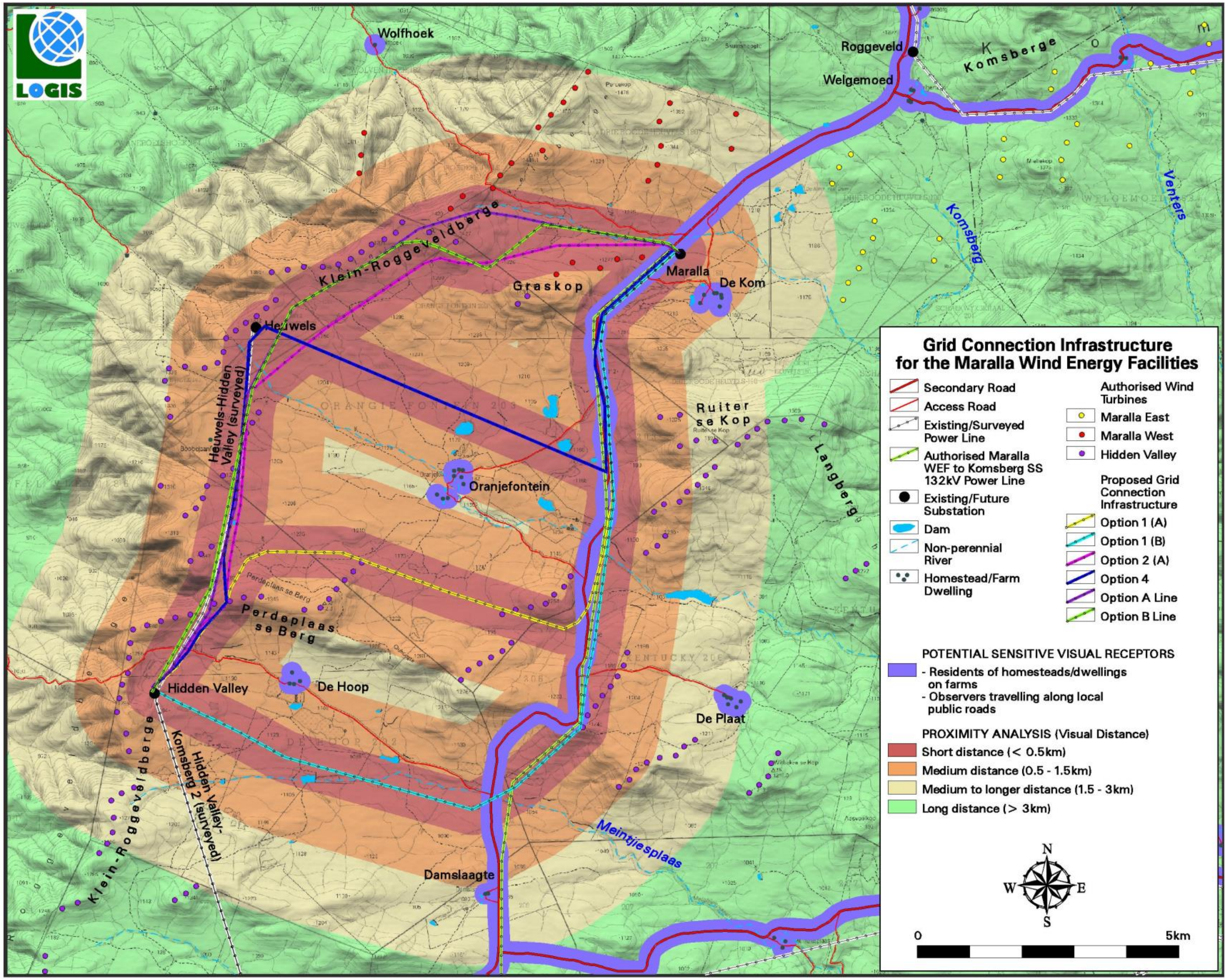
The proposed project infrastructure will not be visible from main roads (i.e. the R354 arterial road). The only public road with a potentially higher viewer incidence is the Komsberg/Kareedoringkraal secondary road. Travellers using this road may be negatively impacted upon by visual exposure to the grid connection infrastructure.

Additional sensitive visual receptors are located at the farm residences (homesteads) throughout the study area. It is expected that the viewer’s perception, unless the observer is associated with (or supportive of) the grid connection infrastructure, would generally be negative.

Due to the very remote location of the proposed power line and the ill populated nature of the receiving environment, there are only seven potential sensitive visual receptor sites located within the study area. These are the residents of, or visitors to:

- Damslaagte
- De Hoop
- De Plaat
- Oranjefontein
- De Kom
- Wolfhoek
- Welgemoed

The latter two homesteads are however beyond the zone of visual influence of the power line structures. It should also be noted that the rest of the dwellings are located on farms earmarked for the Maralla or Hidden Valley WEFs, potentially implying that they may be supportive of the infrastructure associated with these wind farms. Refer to **Map 10**.



Map 10: Proximity analysis and potential sensitive visual receptors.

6.5. Visual absorption capacity

The vegetation cover on the *plateau* is predominantly *Central Mountain Shale Renosterveld* and *Koedoesberge-Moordenaars Karoo*, with *Tanqua Escarpment Shrubland* along the western slopes of the Klein-Roggeveldberge. The land cover types are low shrubland (Fynbos) for most of the study area, with bare sand and rock surfaces in places.

Overall, the Visual Absorption Capacity (VAC) of the receiving environment is low by virtue of the limited height (or absence) of the vegetation, the relatively homogenous landform on the *plateau* and the overall low occurrence of buildings, structures and infrastructure. In addition, the scale and form of the proposed structures mean that it is unlikely that the environment will visually absorb them in terms of texture, colour, form and light/shade characteristics. Within this area the VAC of vegetation will not be taken into account, thus assuming a worst case scenario in the impact assessment.

Where homesteads and settlements occur, some more significant vegetation and trees may have been planted, which would contribute to the visual absorption capacity (i.e. shielding the observers from the infrastructure). As this is not a consistent occurrence, however, VAC will not be taken into account for any of the homesteads or settlements, thus assuming a worst case scenario in the impact assessment.

Figure 14: Low shrubland within the study area – low VAC.

6.6. Visual impact index

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed grid connection infrastructure culminate in a visual impact index. 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.

The criteria (previously discussed in this report) which inform the visual impact index are:

- Visibility or visual exposure of the structures
- Observer proximity or visual distance from the structures
- The presence of sensitive visual receptors
- The perceived negative perception or objections to the structures (if applicable)
- The visual absorption capacity of the vegetation cover or built structures (if applicable)

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.

The index indicates that **potentially sensitive visual receptors** within a 0.5km radius of the project infrastructure may experience a **high** visual impact. The magnitude of visual impact on sensitive visual receptors subsequently subsides with distance to; **moderate** within a 0.5 – 1.5km radius (where/if sensitive receptors are present) and **low** within a 1.5 – 3km radius (where/if sensitive receptors are present). Receptors beyond 3km are expected to have a **very low** or **insignificant** potential visual impact.

Magnitude of the potential visual impact

The visual impact index and potentially affected sensitive visual receptors are indicated on **Maps 11 - 16**. In general, there are only a few receptor sites within closer proximity (3km) to the proposed project infrastructure, namely:

- A section of the Komsberg/Kareedoringkraal secondary road
- Damslaagte
- De Hoop
- De Plaat
- Oranjefontein
- De Kom

The **magnitude** of the potential visual impact on sensitive receptors is discussed per alternative below.

Option 1 (A)

The magnitude of visual impact on a 7.5km stretch of the Komsberg/-Kareedoringkraal secondary road may be **high**.

Potentially affected dwellings/homesteads include De Kom, where the magnitude of impact may be **moderate**, and Oranjefontein and De Hoop where the magnitude of impact may be **low**.

Option 1 (B)

The magnitude of visual impact on a 10km stretch of the Komsberg/-Kareedoringkraal secondary road may be **high**.

Potentially affected dwellings/homesteads include De Kom and De Hoop, where the magnitude of impact may be **moderate**, and De Plaat and Damslaagte where the magnitude of impact may be **low**.

Option 2 (A)

The magnitude of visual impact on a 1km stretch of the Komsberg/-Kareedoringkraal secondary road may be **high**.

Potentially affected dwellings/homesteads include De Kom, where the magnitude of impact may be **moderate**, and De Hoop where the magnitude of impact may be **low**.

Option 4

The magnitude of visual impact on a 5km stretch of the Komsberg/-Kareedoringkraal secondary road may be **high**.

Potentially affected dwellings/homesteads include De Kom and Oranjefontein, where the magnitude of impact may be **moderate**, and De Hoop where the magnitude of impact may be **low**.

Option A Line

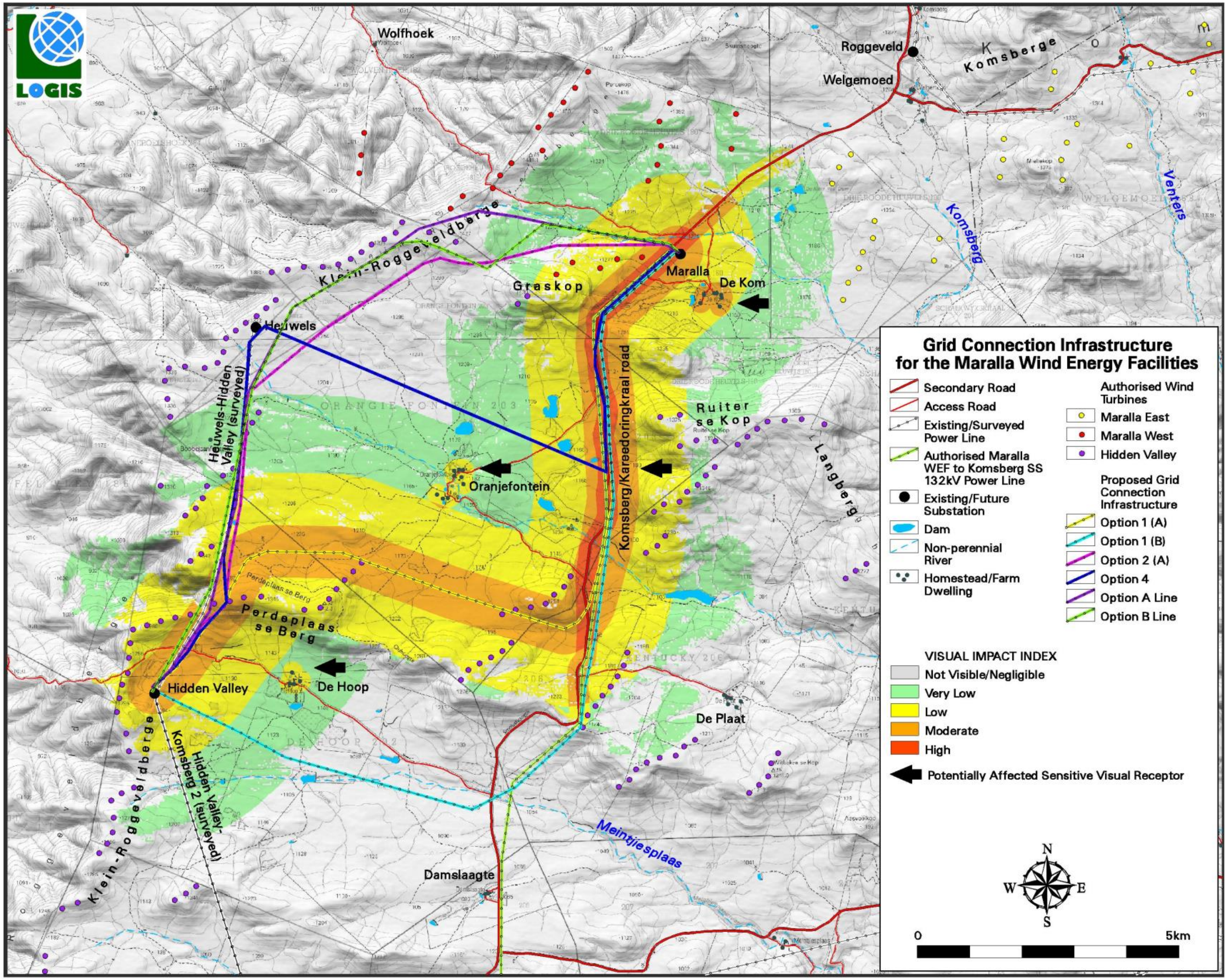
The magnitude of visual impact on a 1km stretch of the Komsberg/-Kareedoringkraal secondary road may be **high**.

Potentially affected dwellings/homesteads include De Kom, where the magnitude of impact may be **moderate**, and De Hoop where the magnitude of impact may be **low**.

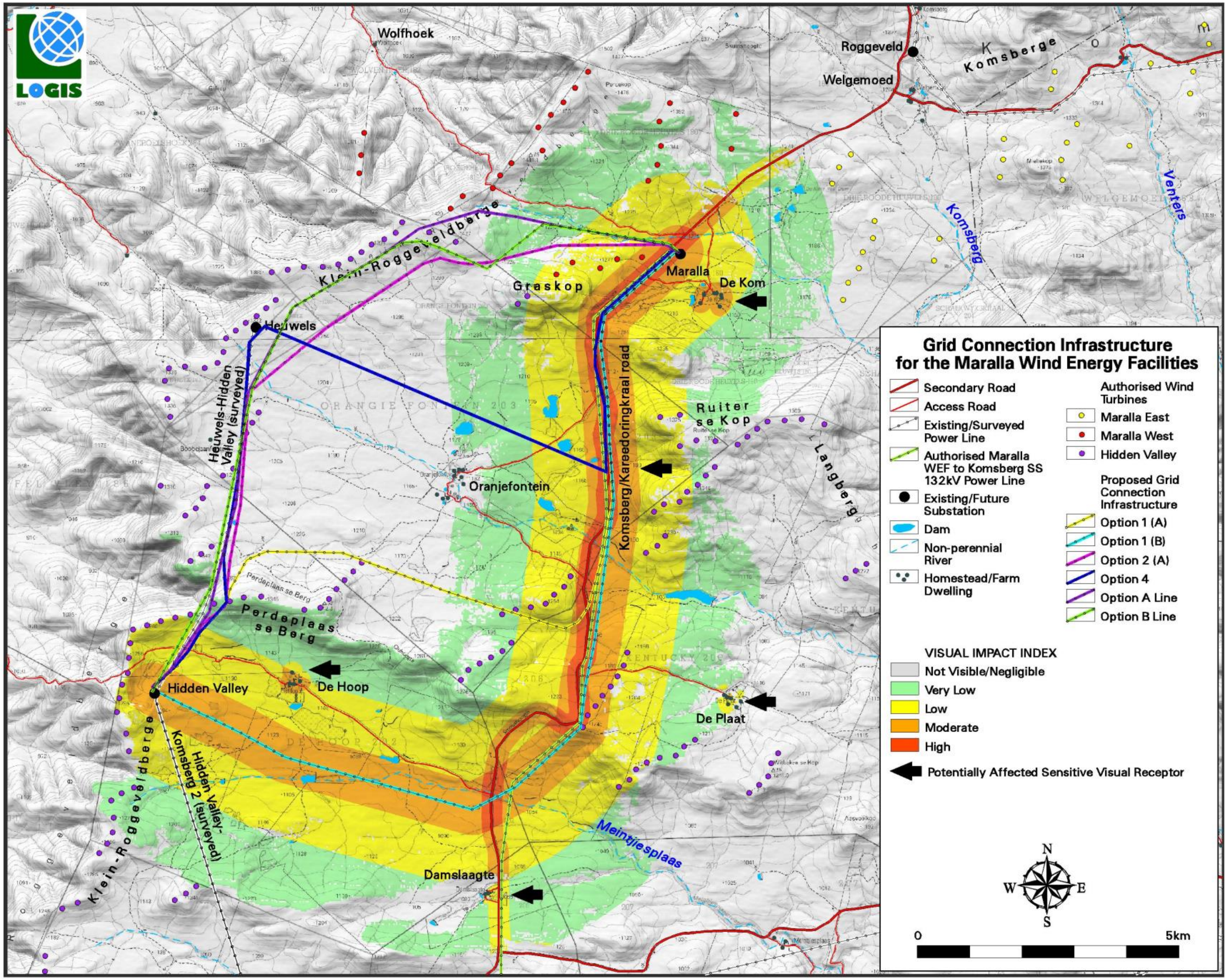
Option B Line

The magnitude of visual impact on a 1km stretch of the Komsberg/-Kareedoringkraal secondary road may be **high**.

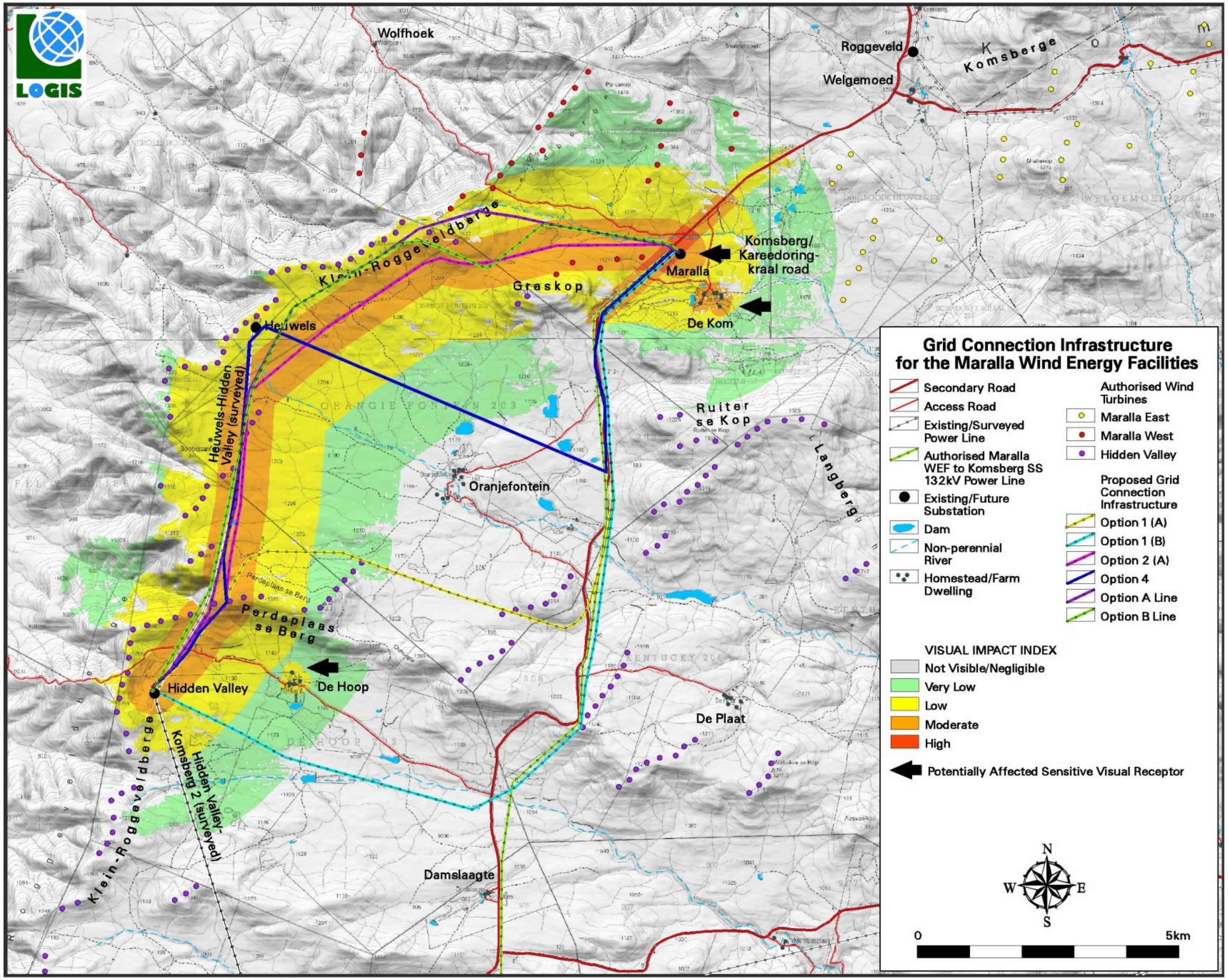
Potentially affected dwellings/homesteads include De Kom, where the magnitude of impact may be **moderate**, and De Hoop where the magnitude of impact may be **low**.



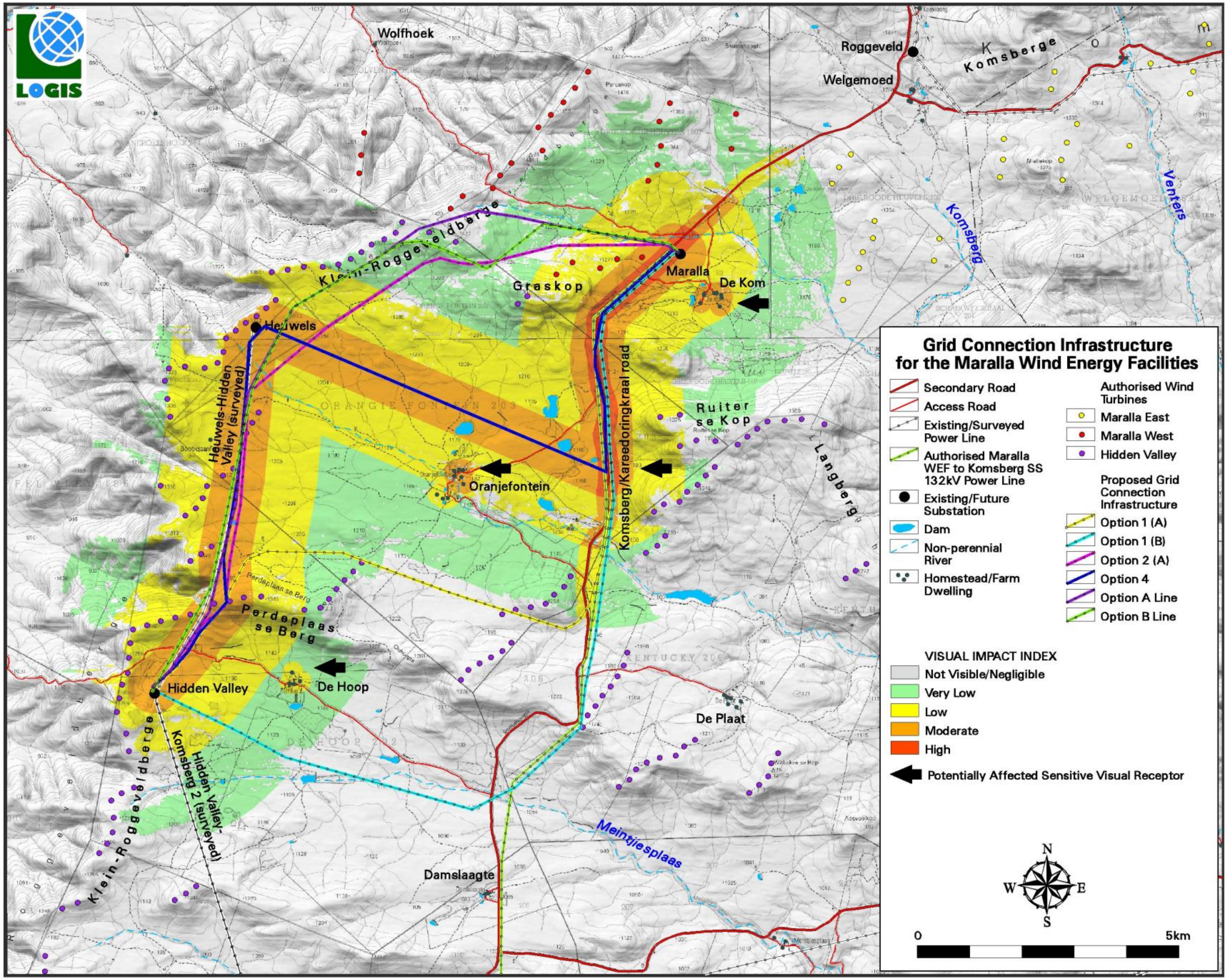
Map 11: Visual impact index and potentially affected sensitive visual receptors: Option 1 (A).



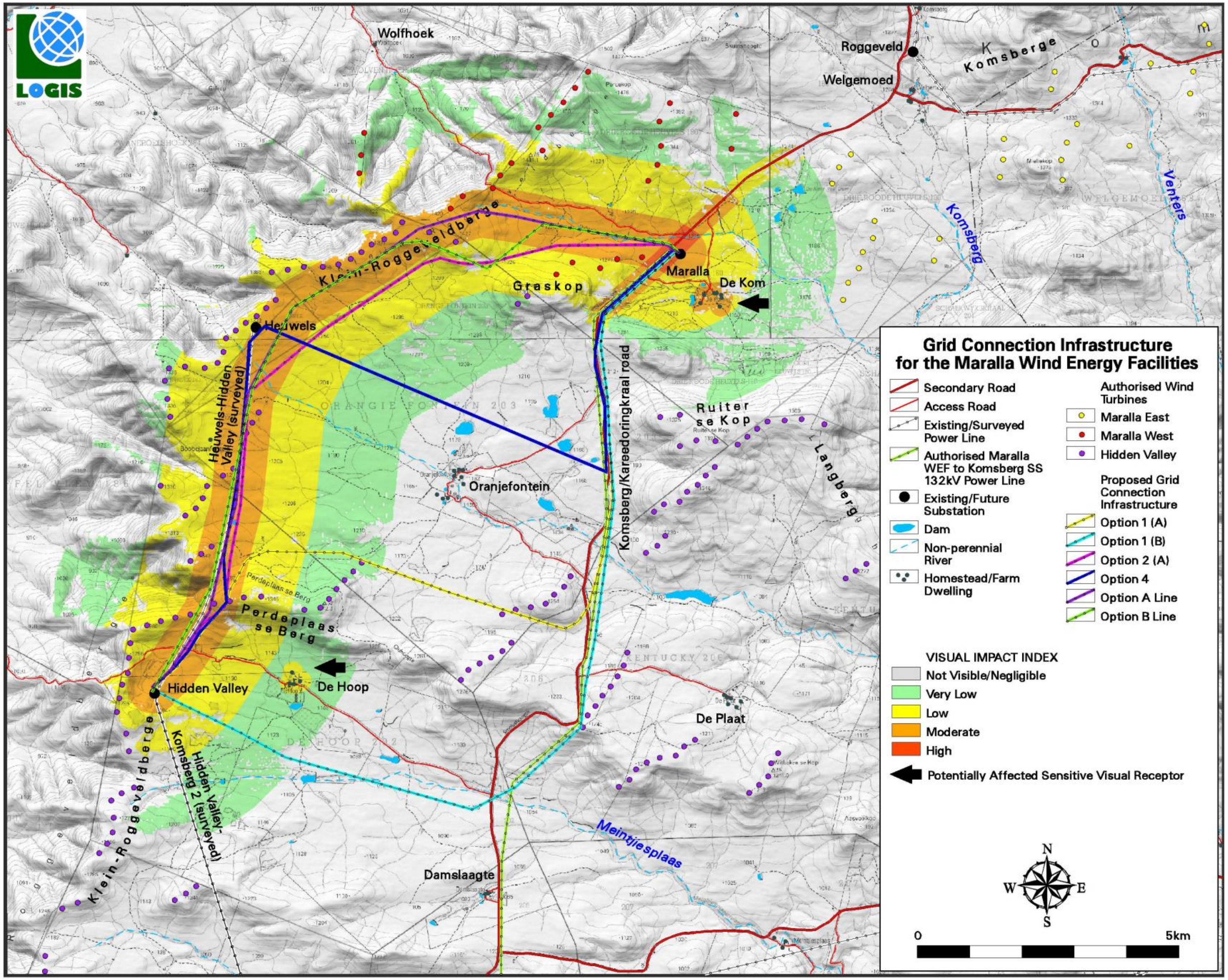
Map 12: Visual impact index and potentially affected sensitive visual receptors: Option 1 (B).



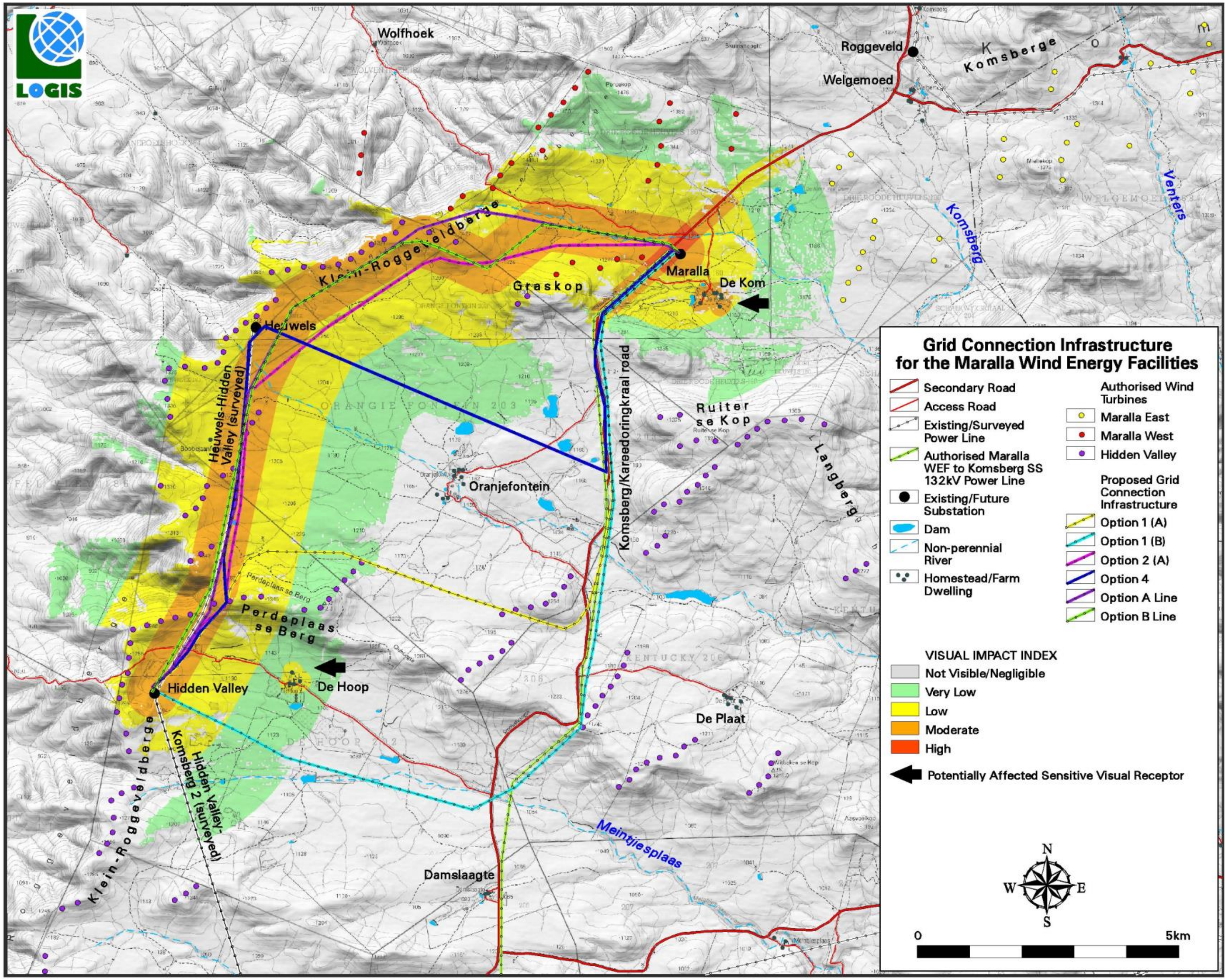
Map 13: Visual impact index and potentially affected sensitive visual receptors: Option 2 (A).



Map 14: Visual impact index and potentially affected sensitive visual receptors: Option 4.



Map 15: Visual impact index and potentially affected sensitive visual receptors: Option A Line.



Map 16: Visual impact index and potentially affected sensitive visual receptors: Option B Line.

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 assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[3], indirect[4], secondary[5] as well as cumulative[6] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[7] presented in **Table 2**.

Table 2: Impact assessment criteria and scoring system.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor[8]	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor[9]	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries

3 Impacts that arise directly from activities that form an integral part of the Project.
4 Impacts that arise indirectly from activities not explicitly forming part of the Project.
5 Secondary or induced impacts caused by a change in the Project environment.
6 Cumulative impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
7 The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.
8 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.
9 Local = within 0.5km of the grid connection infrastructure. Regional = between 0.5 - 3km from the infrastructure.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				

IMPACT SIGNIFICANCE RATING					
Total Score	**4 -15**	**16 – 30**	**31 - 60**	**61 to 80**	**81 – 100**
Environmental Significance Rating (Negative (-))	**Very Low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very Low**	**Low**	**Moderate**	**High**	**Very High**

6.8. Visual impact assessment

The primary visual impacts of the proposed grid connection infrastructure for the Maralla 132kV Transmission Integration Project are assessed below.

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 power line and substation 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 ratings = 18 and 16) temporary visual impact both before and after mitigation.

Table 3: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed grid connection infrastructure.

Potential Impact Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed grid connection infrastructure.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	2	2	3	2	2	**18**	**Low**	(-)	High
With Mitigation	1	2	3	2	2	**16**	**Low**	(-)	High
Mitigation and Management Measures	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.									

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

The power line is expected to have a **low** visual impact (significance rating = 26) on observers within a 0.5km radius of the power line structures. This is due to the general absence of potentially sensitive visual receptors brought about by the remote location of the infrastructure. The area of potential visual impact (i.e. the homesteads mentioned in **Section 6.6**) is unlikely to be affected, as these dwellings are all located on the properties earmarked for either the Hidden Valley of Maralla WEFs, implying their approval of the WEF infrastructure.

The Komsberg/Kareedoringkraal secondary road may be affected by Options 1 (A), 1 (B) and 4 (more so than by Options 2 (A), A Line and B Line), but this road does not carry a large amount of traffic, and is not considered as a regional tourist route. It is further expected that once the wind turbine structures are constructed, the much larger wind turbines would distract attention away from the more constrained power line structures.

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 on observers in close proximity to the proposed grid connection infrastructure.

Potential Impact	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Visual impact on observers travelling along the roads and residents at homesteads in close proximity to the power line structures.									
Without Mitigation	4	2	3	4	2	**26**	**Low**	(-)	High
With Mitigation	4	2	3	4	2	**26**	**Low**	(-)	High
Mitigation and Management Measures	Planning: • Retain/re-establish and maintain natural vegetation immediately adjacent to the power line servitude. Operations: • Maintain the general appearance of the infrastructure. Decommissioning: • Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.								

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

The grid connection infrastructure will have a **low** visual impact (significance rating = 26) on observers traveling along the roads and residents of homesteads within a 1.5 - 3km radius of the 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 5: Visual impact of the proposed grid connection infrastructure within the region.

Potential Impact	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
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	3	3	3	4	2	**26**	**Low**	(-)	High
With Mitigation	3	3	3	4	2	**26**	**Low**	(-)	High
Mitigation and Management Measures	<u>Planning:</u> • Retain/re-establish and maintain natural vegetation immediately adjacent to the power line servitude. <u>Operations:</u> • Maintain the general appearance of the infrastructure. <u>Decommissioning:</u> • Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.								

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 predominantly rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development and power generation/distribution infrastructure represents existing visual disturbances.

The anticipated visual impact of the proposed grid connection infrastructure on the regional visual quality (i.e. beyond 3km of the proposed infrastructure), and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance.

Table 6: The potential impact on the sense of place of the region.

Potential Impact The potential impact of the development of the proposed grid connection infrastructure on the sense of place of the region.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Confidence**
Without Mitigation	2	3	3	4	2	**24**	**Low**	(-)	High
With Mitigation	2	3	3	4	2	**24**	**Low**	(-)	High
Mitigation and Management Measures	Planning: • Retain/re-establish and maintain natural vegetation immediately adjacent to the power line servitude. Operations: • Maintain the general appearance of the infrastructure. Decommissioning: • Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.								

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 Maralla 132kV Transmission Integration Project may increase the cumulative visual impact of industrial type infrastructure within the region.

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 proposed infrastructure and the presence of the existing/authorised electricity distribution infrastructure, and the potential future wind turbine structures.

Table 7: The potential cumulative visual impact on the visual quality of the landscape.

Nature of Impact: The potential cumulative visual impact of the grid connection infrastructure on the visual quality of the landscape.		
	Overall impact of the proposed project considered in isolation (with mitigation)	***Cumulative impact of the project and other projects within the area (with mitigation)***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(4)**	High **(4)**
Probability	Improbable **(2)**	Highly Probable **(4)**
Significance	Low **(26)**	Moderate **(52)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(3)**	Reversible **(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 infrastructure is removed. Failing this, the visual impact will remain.	

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 appropriate and effective 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.

  - 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 Maralla 132kV Transmission Integration Project may have a visual impact on the study area, especially within a 0.5km radius (and potentially up to 1.5km) of the power line structures. The visual impact will differ amongst places, depending on the distance from the infrastructure.

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.

Even though none of the alignment alternatives are considered fatally flawed, the **Option 2 (A)** alignment has the greatest opportunity to remove the potential visual impact away from the Komsberg/Kareedoringkraal secondary road. It also has the highest potential to consolidate the linear infrastructure within the region e.g. it will traverse adjacent to the authorised (surveyed) Heuwels-Hidden Valley power line for 6km. It is also the shortest alignment and is therefore the preferred alternative from a visual impact perspective.

A number of mitigation measures have been proposed (**Section 6.10.**). 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 Maralla 132kV Transmission Integration Project 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 Maralla 132kV Transmission Integration Project indicate that the visual environment surrounding the power line, especially within a 1.5km radius, may be visually impacted upon for the anticipated operational lifespan of the grid connection infrastructure.

This impact is applicable to the proposed grid connection infrastructure and to the potential cumulative visual impact of the infrastructure in association with existing power line infrastructure (and future power generation infrastructure) within the region.

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

- During the construction, there may be an increase in heavy vehicles utilising the roads to the power line 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 negative visual impact after mitigation.

- The grid connection infrastructure is expected to have a **low** negative 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** negative 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** negative significance. This is due to the relatively low viewer incidence within close proximity to the proposed grid connection infrastructure.

- The anticipated cumulative visual impact of the proposed grid connection infrastructure is expected to be of **moderate** negative 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 power line and the presence of the existing 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 power line 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 6.10.**) and management programme (**Section 9.**).

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. Refer to **Tables 8 – 11** below.

Table 8: 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 Maralla 132kV Transmission Integration Project.	
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, as far as practically feasible.	Project proponent / design consultant	Planning phase.
Performance Indicator	No visible degradation of access roads and other associated infrastructure from surrounding areas.	
Monitoring	Not applicable.	

Table 9: 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 132kV power line.	
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 appropriate and effective dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Project proponent / contractor	Throughout the construction phase.
Restrict construction activities to daylight hours, as far as possible, 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 has been maintained as far as possible and disturbed areas have been rehabilitated with no evidence of erosion.	
Monitoring	Monitoring of vegetation clearing during construction. Monitoring of rehabilitated areas post construction.	

Table 10: 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 Maralla 132kV Transmission Integration Project.	
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 11: 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 Maralla 132kV Transmission Integration Project.
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:	Rehabilitated vegetation in all disturbed areas.

Target/Objective		
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 use of the sites. If necessary, consult an ecologist to give input into rehabilitation specifications.	Project proponent / operator	During the decommissioning phase.
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.	

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