Appendix G.5

VISUAL REPORT

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PHEFUMULA EMOYENI ONE

VISUAL IMPACT ASSESSMENT FOR THE PROPOSED PHEFUMULA EMOYENI ONE ELECTRICAL GRID INFRASTRUCTURE

IMPACT ASSESSMENT REPORT

41105236-REP-00XX
FEBRUARY 2025

CONFIDENTIAL

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REPORT (DRAFT) CONFIDENTIAL

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IMPACT ASSESSMENT REPORT

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ABBREVIATIONS

Abbreviations	
BESS	Battery energy storage system
DEM	Digital elevation model
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
ha	Hectares
LTV	Level of theoretical visibility
O&M	Operations and maintenance
OHL	Overhead power line
PEO	Phefumula Emoyeni One
SP	Significance points
VAC	Visual absorption capacity
VIA	Visual Impact Assessment
WEF	Wind Energy Facility
WSP	WSP Group Africa (Pty) Ltd

DETAILS OF THE SPECIALIST

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DECLARATION OF INDEPENDENCE BY SPECIALIST

I, Johan Bothma declare that I –

- Act as the independent specialist for the undertaking of a specialist report for the proposed Phefumula Emoyeni One Grid Infrastructure Project;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed;
- Do not have nor will have a vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity; and
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan, or document.

1 INTRODUCTION

WSP Group Africa (Pty) Ltd (WSP) was appointed by Phefumula Emoyeni One Pty Ltd (PEO), a subsidiary of Seriti Green (Pty) Ltd, to conduct a Visual Impact Assessment (VIA), for the grid connection infrastructure of the proposed PEO Grid Connection near the town of Ermelo, in the Mpumalanga Province of South Africa.

This VIA forms part of the environmental permitting process required for the proposed PEO grid connection infrastructure development, and this report presents:

- A visual baseline description of the project site and surrounding landscape
- A determination of the visual resource value of the proposed project site and surrounding study area and associated sensitivity verification
- Preliminary identification of:
  - Potential visual receptors
  - Screening of visual impacts for proposed project activities during the various project phases
  - Recommended mitigation measures
- Proposed methodology for impact assessment

The proposed grid connection comprises the following:

- Construct 2 x 1 km (estimated) 400 kV loop-in-loop-out of the existing Camden – Duvha 400 kV line 1 to the new proposed Main Transmission Substation (MTS)
- Establish a new 400/132 kV MTS, with 2 x 400 kV feeder bays, of approximately 17.4 ha footprint
- Establish 3 x Distribution (DX) substations (one per each phase). The IPP substation will be constructed adjacent to the Dx subs
- Establish 3 x 132 kV overhead lines (OHL) from each Dx sub to the MTS (total length approx. 36.37 km)

Note that this VIA is for the PEO project grid connection and associated transmission infrastructure only, and that the main WEF facilities are the subject of a separate permitting process and VIA.

1.1 LOCATION OF THE PROJECT SITE

The proposed grid connection site is located approximately 25 km north-west of Ermelo in the Msukaligwa Local Municipality of the Gert Sibande District Municipality in the Mpumalanga Province. The locality of the site within the region is shown in Figure 1-1.

The site can be accessed via the N11 and existing access roads from the east. The grid connection infrastructure will be developed within a project site which covers a total area of approximately 593.88 ha which is currently used for crop farming.

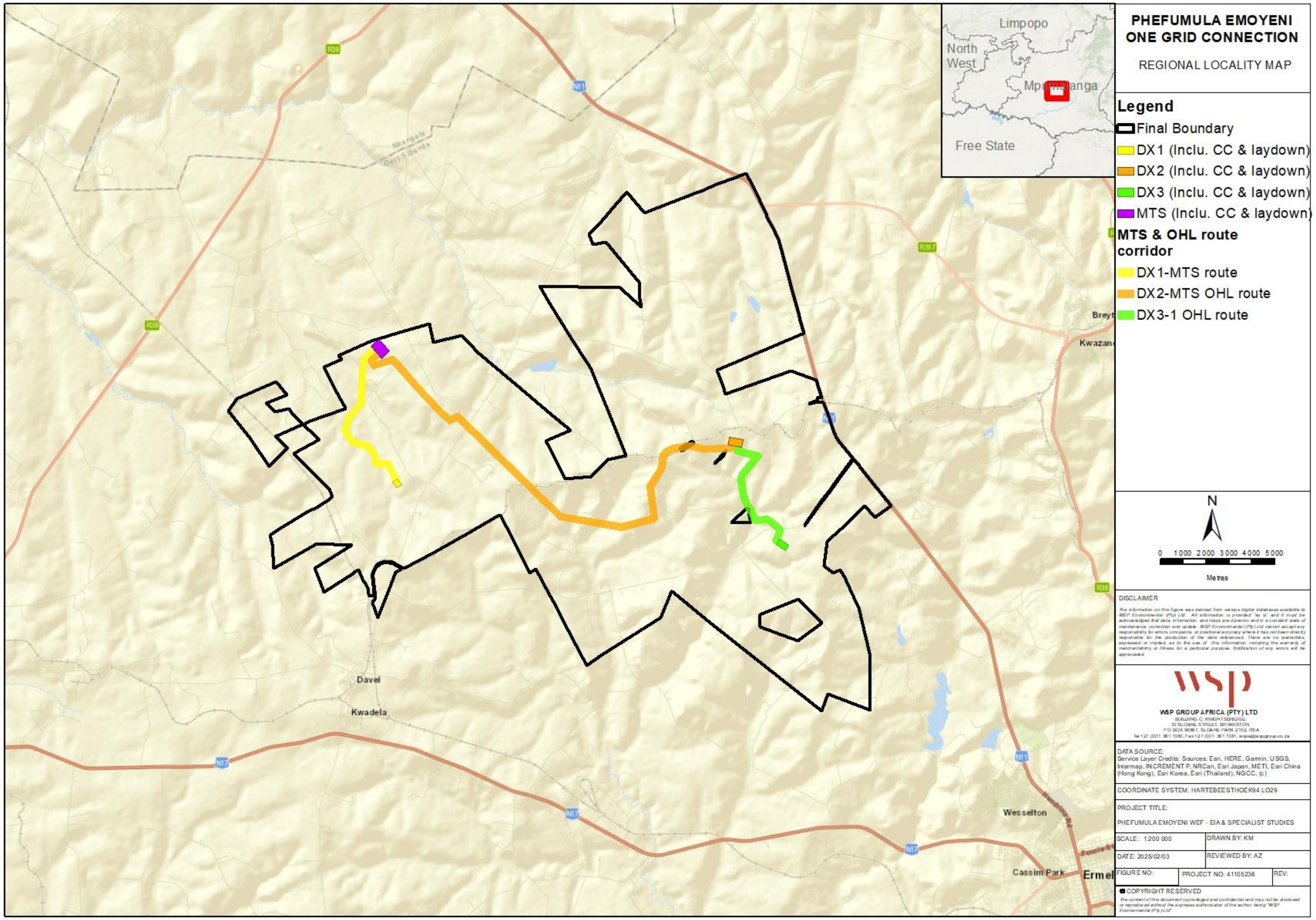

Figure 1-1 - Locality map of PEO grid infrastructure site

1.2 PROJECT DESCRIPTION

The project will entail various components, which depending on their level of visibility may result in a visual impact on the existing landscape. The main project components are illustrated by the layout map (Figure 1-2) and elaborated on in more detail in Table 1-1.

The project will entail the development of various components that are expected to result in a potential visual impact, either as temporary impacts during the construction/decommissioning phases, and/or long-term impacts during the operational phase (Table 1-1):

Table 1-1 – Visible project components that are expected to cause a visual impact

Detail	Information
Up to 400 kV transmission line	▪ 400 kV loop-in-loop-out (LILO) OHL ▪ Servitude width for 1 x up to 400 kV transmission line is 60 m for LILO ▪ Height of 1 x 400 kV power line structure is on average 48 m, but may reach up to 50 m in exceptional circumstances depending on the complexity and slope of the terrain ▪ Minimum conductor clearance is between 8.1 and 12.6 m ▪ Span length between pylon structures is typically up to 100 – 250 m apart, depending on complexity and slope of terrain ▪ For up to 400 kV structures footprint sizes may vary depending on design type up to 110 m^2 (10.5 m by 10.5 m), with concrete foundations of up to 80 m^2 and depths reaching up to 3.5 m typically depending on the number and design of the foundations (to be determined during the detailed design engineering phase). The actual number of structures required will vary according to the final route alignment determined ▪ Pylon structures will be either monopole or lattice structures depending on what is identified as appropriate during final design ▪ For safety reasons, transmission lines require certain minimum clearance distances. These are as follows: ▪ The minimum vertical clearance distance between the ground and the transmission line is 6.7 m ▪ The minimum vertical clearance to any fixed structure that does not form part of the transmission line is 9.4 m – 11 m ▪ The minimum distance between an up to 400 kV transmission line and an existing road is 60 m – 120 m (depending on the type of road) ▪ Any farming activity can be practiced under the conductors provided that safe working clearances and building restrictions are adhered to
Up to 132 kV transmission lines	▪ The servitude width for 1x up to 132 kV transmission line is 31 m. A 300 m corridor must be assessed (150 m on either side of the centre line) to allow for micro-siting. In the case of the Loop-In-Loop-Out alternative this servitude will apply to each of the two connecting power lines ▪ The maximum height for an up to 132 kV powerline structure is 40 m ▪ Pylon structures will be either monopole or lattice structures depending what is identified as appropriate during final design. ▪ Pylon structures may require anchors with guy-wires or be anchorless ▪ For up to 132 kV structures, concrete foundation sizes may vary depending on design type up to 80 m^2 (10 m by 8 m), with depths reaching up to 3.5 m typically in a rectangular 'pad' shape ▪ A working area of approximately 100 m x 100 m is needed for each of the proposed structures to be constructed

Detail	Information
Main transmission substation (MTS) (approx. 17.4 ha)	▪ A high voltage substation yard to allow for multiple 132 kV and 400 kV feeder bays and transformers, with infrastructure to allow for step-up to 400 kV as required ▪ Standard substation electrical equipment, including but not limited to transformers, busbars, office area, operation and control room, workshop, and storage area, feeder bays, transformers, busbars, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be needed ▪ The control building, telecommunication infrastructure, oil dam(s) etc. ▪ Workshop and office area within the collector substation footprint, ▪ Fencing around the substation ▪ All the access road infrastructure to and within the substation
Three distribution substations	▪ Dx1-approx. 7.85 ha footprint ▪ Dx2- approx. 20.45 ha footprint ▪ Dx3- approx. 13.6 ha footprint
Temporary/ construction phase infrastructure	▪ Construction compound at the MTS (3 ha) (site offices including conservancy tank for ablutions, stores, material laydown area, generator, fuel storage, etc.) ▪ 3 x construction compound / laydown areas, including site office of 3 ha each at each of the Dx locations (150 m x 200 m each) (including conservancy tank for ablutions) ▪ Batch plant of 4-7 ha (unless a commercial source is used and concrete trucked to site, preferable to keep options open) ▪ Portable ablution facilities will be used along the powerline routes

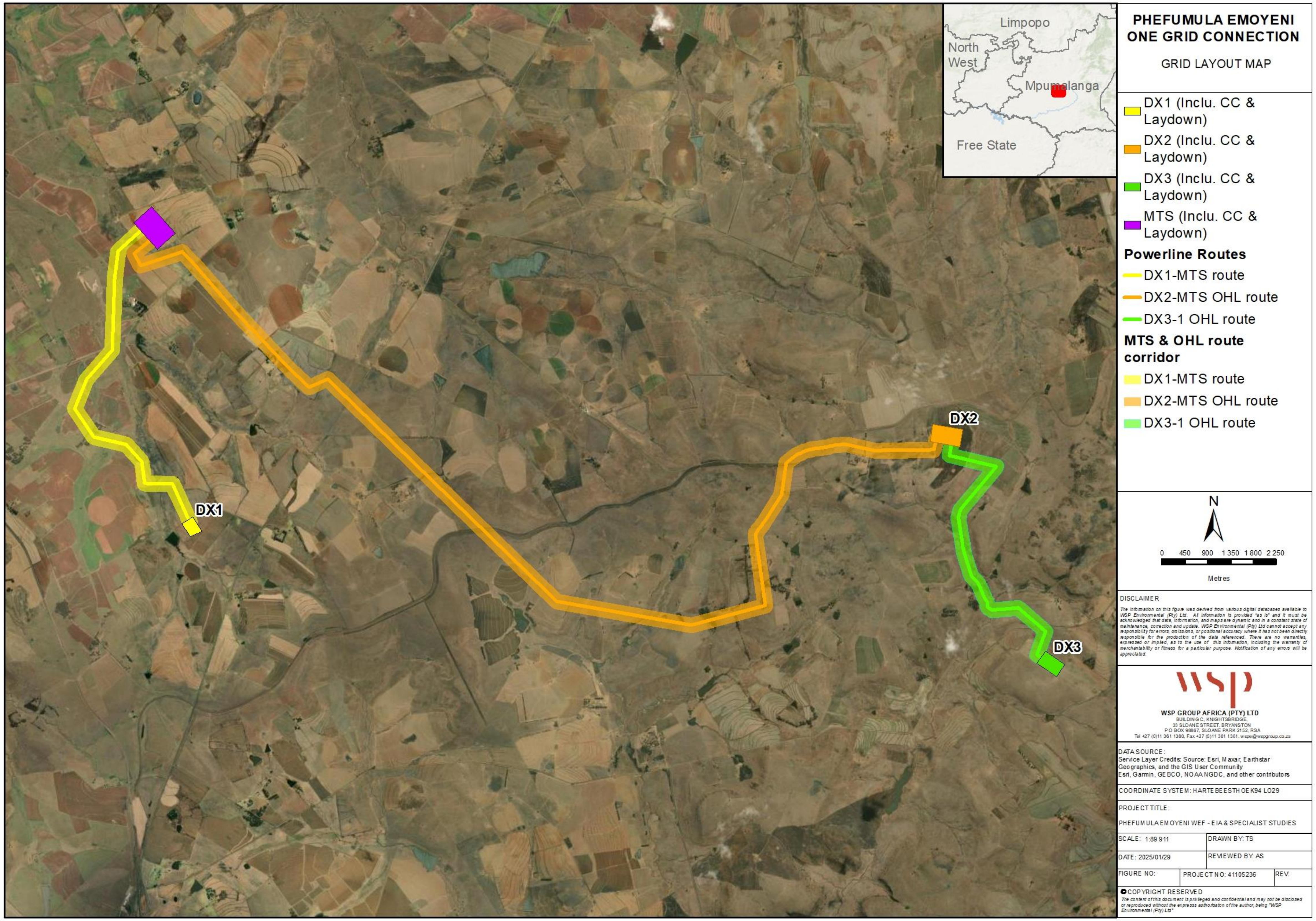

Figure 1-2 – Layout map of the proposed PEO grid connection infrastructure

1.3 VISUAL STUDY AREA

The study area for the VIA comprises the spatial extent of the project footprint and related activities, as well as an associated buffer area.

A visual impact will be caused by all visible infrastructural components as part of the project, as well as all areas where the physical appearance of the landscape will be altered by earthworks and construction activities. The areas from which these proposed landscape alterations are expected to be visible are therefore defined as the study area.

As per WSP's standard methodology developed for VIAs, the study area was defined as a 5 km radius around the physical footprint of the proposed PEO grid infrastructure and project site. The 5 km study area was defined as the pylons and especially the associated OHLs are not expected to have a significant impact over greater distances, due to the visually "poriferous" nature of the structures

- For the purposes of this VIA, the term 'project site' or 'site' refers to proposed PEO Grid Connection infrastructure footprint
- The term "study area" refers to the area that will potentially be visually affected by the project and represents the 5 km radius buffer around the total project site. Visual receptors occurring within the study area are also indicated, and further considered during the impact assessment process (refer to Section 7)

2 STUDY METHODOLOGY

2.1 VIA METHODOLOGY

The VIA specialist study was conducted using the following methodology:

<u>Scoping phase:</u>

- Reviewing the preliminary findings of the flicker and landscape site environmental sensitivity as per the project *Screening Report for an Environmental Authorization as Required by the 2014 EIA Regulations*, dated 04/09/2023
- Describing the landscape character or <u>visual baseline</u> based on:
  - A review of available aerial imagery and topographical maps, focusing on the both natural- and human-made elements
  - A site visit conducted on 05 October 2023
- Determining the <u>visual resource value</u> of the landscape based on:
  - The topographical character of the study area and potential occurrence of landform features of interest
  - The presence of water bodies within the study area
  - The general nature and level of disturbance of existing vegetation cover within the study area
  - The nature and level of anthropogenic disturbances and transformation
- Determining the sensitivity of the study area regarding visual resource using the national web-based environmental impact assessment screening tool
- Determining the <u>visual absorption capacity</u> of the receiving visual landscape
- Determining the <u>receptor sensitivity</u> to the proposed project

- Conducting Screening Assessment for construction, operation and decommissioning phases based on the project description
- Identifying preliminary visual mitigation measures for the impacts identified during the screening assessment

Impact assessment phase:

- Determining the magnitude of potential impacts within the existing visual context by considering the proposed project in terms of:
  - Visibility
  - Visual intrusion
  - Visual exposure
- Assessing the impact significance by relating the magnitude of the visual impact to:
  - Impact extent
  - Impact reversibility
  - Impact duration
  - Probability of occurrence
- Based on the outcomes of the impact assessment, refining mitigation measures to reduce the potential negative visual impacts of the project, were feasible.

2.2 LEGISLATIVE REQUIREMENTS AND INDUSTRY PRACTICE

For the purposes of conducting the VIA, guidance has been taken from the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for Involving Visual and Aesthetic Specialists in the EIA Process (Oberholzer, 2005). These are the only VIA guidelines that have been issued in South Africa. Additional guidance has also been taken from other reference works in the field of visual assessment, listed in Section 13.

Further, in accordance with the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes, which were promulgated in Government Notice No. 320 of 20 March 2020 and in Government Notice No. 1150 of 30 October 2020 (i.e. "the Protocols"), and Appendix 6 of the EIA Regulations. The protocols used are the "*Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been Prescribed",* which are referenced to the report content as indicated in Table 2-1:

Table 2-1 - Appendix 6 of the EIA Regulations specialist study checklist

Report content requirement	Reference
A specialist report prepared in terms of these Regulations must contain—	
(a) details of— (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Refer to details of the specialist section after the table of contents

Report content requirement	Reference
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer to declaration of independence by specialist after the table of contents
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Refer to Sections 1 and 2
(cA) an indication of the quality and age of base data used for the specialist report;	Refer to Section 2
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Refer to Section 4.2 for a description of existing impacts on site, cumulative impacts will be assessed during the impact assessment phase
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Refer to Section 2 for information regarding the date and season, and Sections 3 and 4.7 for relevance of seasonal influences on assessment outcome
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Refer to section 2.1 for methodology, as well as 9.2.1 of specialised process to (viewshed analysis) to follow during impact assessment
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Refer to Section 5
(g) an identification of any areas to be avoided, including buffers;	Refer to Section 5.3
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	The development layout will be finalised at the end of the scoping phase, and will be superimposed on visual sensitivities map and further evaluated during the impact assessment phase
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Refer to Section 3
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Initial findings regarding visual resource value, receptor sensitivity, identified impacts and mitigation are presented as elsewhere indicated in this table, and will be further evaluated during impact assessment

Report content requirement	Reference
(k) any mitigation measures for inclusion in the EMPr;	Refer to Section 10 for preliminary mitigation measures, which will be further evaluated during impact assessment
(l) any conditions for inclusion in the environmental authorisation;	None noted yet, will be further evaluated during impact assessment
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	None noted yet, will be further evaluated during impact assessment
(n) a reasoned opinion— (i) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	None noted yet, will be further evaluated during impact assessment. Refer to Section 10 for the proposed visual mitigation strategy and preliminary measures
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	No consultation was conducted, however the study was conducted using widely acknowledged principles of visual assessment as noted in Section 9.2
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	None received yet
(q) any other information requested by the competent authority	None received yet
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Not applicable

3 ASSUMPTIONS AND LIMITATIONS

The following qualification is relevant to the field of VIA and the findings of this study:

- The layout of individual project components, specifically the locations of individual pylons and other vertical infrastructure, and temporary impacts such as batching plants have not been determined/finalised yet, and the findings of this VIA are based on the available development description. Initial recommendations regarding the location of specific project infrastructure, including potential "no-go" areas, visual impacts associated with the project and proposed mitigation measures as included in this report, are therefore preliminary in nature and may still be revised and updated during the detail design phase.

- Similarly, the selection of specific technology has not been finalised in all instances. However, in most cases the specific choice of technology is not expected to materially influence the findings of the impact assessment, as the overall alignment of transmission line is expected to be the most determining factor during the visual impact assessment.
- Artificial landforms and structures, such as berms, stockpiles, buildings, and even tall vegetation will all impact the level of visibility of individual project components. However, given the limited development within the study area the influence of these elements during the viewshed analysis to be conducted during the impact assessment phase is expected to be limited.
- Determining the value, quality and significance of a visual resource or the significance of the visual impact that any activity may have on it, in absolute terms, is not achievable. The value of a visual resource is partly determined by the viewer and is influenced by that person's socio-economic, cultural, and individual background, and is even subject to fluctuating and intangible factors, such as emotional mood and appreciation of "sense of place".
- This situation is compounded by the fact that the conditions under which the visual resource is viewed can change dramatically due to natural phenomena, such as weather conditions and seasonal change. Visual impact cannot therefore be measured simply and reliably, as is for instance the case with water, noise, or air pollution.
- It is therefore not possible to conduct a visual assessment without relying to some extent on the expert opinion of a qualified consultant, which is inherently subjective. The subjective opinion of the visual consultant is however unlikely to materially influence the findings and recommendations of this study, as a wide body of scientific knowledge exists in the industry of VIA, on which findings are based.
- The graphic representation of any infrastructure to follow during impact assessment will be conceptual in nature only and is meant to illustrate the visual appearance of the project development, rather that convey technical or engineering aspects of the project. The locations of individual elements within the landscape will be approximate only, based on the preliminary layout, and may be further adjusted based on the final project layout. The appearance of the individual infrastructure components may differ from what is depicted based on specific technology and other factors.

4 BASELINE VISUAL ENVIRONMENT

4.1 FINDINGS OF ENVIRONMENTAL AUTHORISATION SCREENING REPORT

The *Screening Report for an Environmental Authorization as Required by the 2014 EIA Regulations*, dated 04/09/2023 for the proposed project indicated various locations within the site that are of high to very high landscape (visual) environmental sensitivity (Figure 4-1). The areas of higher visual landscape sensitivity appear to correlate with drainage lines and associated wetlands/vegetation cover, as well as ridges and other topographical features. These aspects are further evaluated and reported on in Sections 4.2 to Section 7.

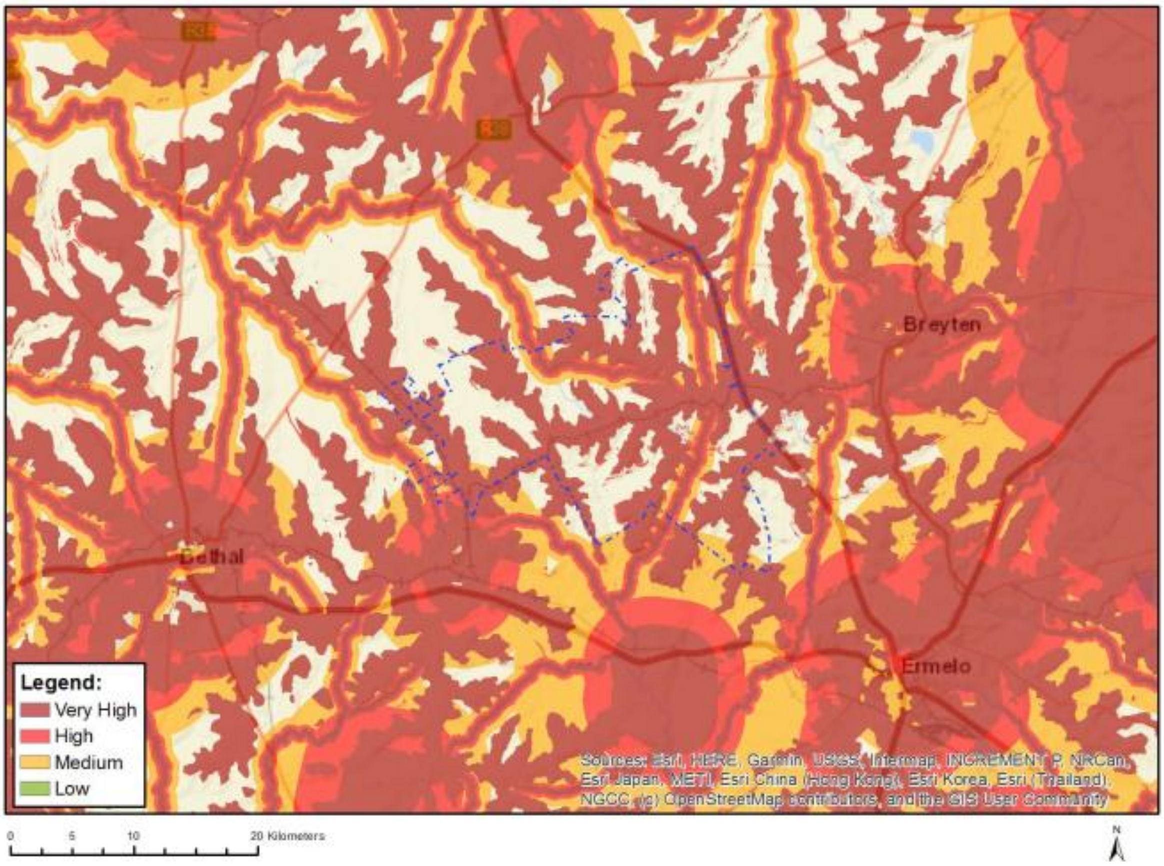

Figure 4-1 - Map of relative landscape (wind) theme sensitivity

4.2 GENERAL LANDSCAPE CHARACTERISTICS

The visual baseline presented in this section is predicated on site observations, as well as Google Earth imagery. To determine the visual resource value of the study area, the following factors were considered:

- General topography, including prominent or appealing landforms, and their spatial orientation relative to the project site.
- Nature of existing vegetation cover with respect to overall appearance, density and height, and level of disturbance.
- Location, physical extent, and appearance of water bodies.
- Nature and level of anthropogenic transformation or disturbance and the perceived level of compatibility of existing land uses.

This section provides a brief overview of the visual baseline environment and context in which the proposed grid infrastructure project will take place.

The study area is in the Mpumalanga Highveld. The region has historically been dominated by farming and other agricultural uses, with vast areas under cultivation and livestock grazing. More recently, several opencast surface mining operations have been established directly east of the study area. Ermelo and the much smaller Breyten are located southeast and east of the study area respectively, while Bethal and the smaller Hendrina are located further west and north, respectively. These urban centra, and especially their associated townships, are characterised by ongoing expansion.

The study area visual baseline is further described in the following subsections and illustrated by various maps and photos, the latter as per the photo location map (Figure 4-15).

4.3 TOPOGRAPHY

The natural topography is characterised mainly by rolling plains and low hills in most areas, which is locally interspersed by small ridges and flattish plateaus (Figure 4-2). The study area is roughly bisected by a non-prominent east-west watershed. Lower-lying areas are associated with the numerous small drainage lines and larger streams, that drain the study area from the main central watershed to the northwest and the south respectively, which also represents the general fall in elevation.

Most of the small rises formed by these watersheds are not prominent or steep, and therefore do not form specific visual landmarks or characteristic features, however a few of the larger landforms are landmarks in shorter-range views (Figure 4-3). Nevertheless, the natural topography of the site itself and much of the immediate surroundings remain largely untransformed and contribute to the rural appeal of the setting.

Figure 4-2 - Rolling plains and low hills are locally interspersed by small ridges and flattish plateaus

Figure 4-3 – Example of a small hill forming a landmark in a short-range view

4.4 HYDROLOGY (DRAINAGE FEATURES)

Many smaller, partially perennial drainage lines as well as a few larger, permanent streams traverse the study area and become more visually prominent towards the northern and southern edges of the study area. An extensive network of wetlands is also associated with these runoff drainage features and comprise mainly seep and channelled valley-bottom wetlands, which become floodplain wetlands outside and to the west and northwest of the project site (Figure 4-6). However, from a visual perspective these are often indistinct from the surrounding areas and differentiated by a subtle change in vegetation, rather than by visible water. In addition, a few small pans also dot the study area, with various larger pans located outside and to the northwest and southwest of the project site.

Many earth-embankment dams of varying sizes are located throughout the project site, and several larger dams with engineered dam walls also occur in downstream sections of drainage lines within the project site. These large bodies of standing water often form prominent features in the landscape, especially in short- and medium-range views (Figure 4-4) and also tend to attract water fowl and other bird species (Figure 4-5) and are sometimes edged by more diverse vegetation cover.

Figure 4-4 - Larger bodies of standing water often form prominent features in the landscape

Figure 4-5 – Bodies of standing water attract several waterfowl and other bird species

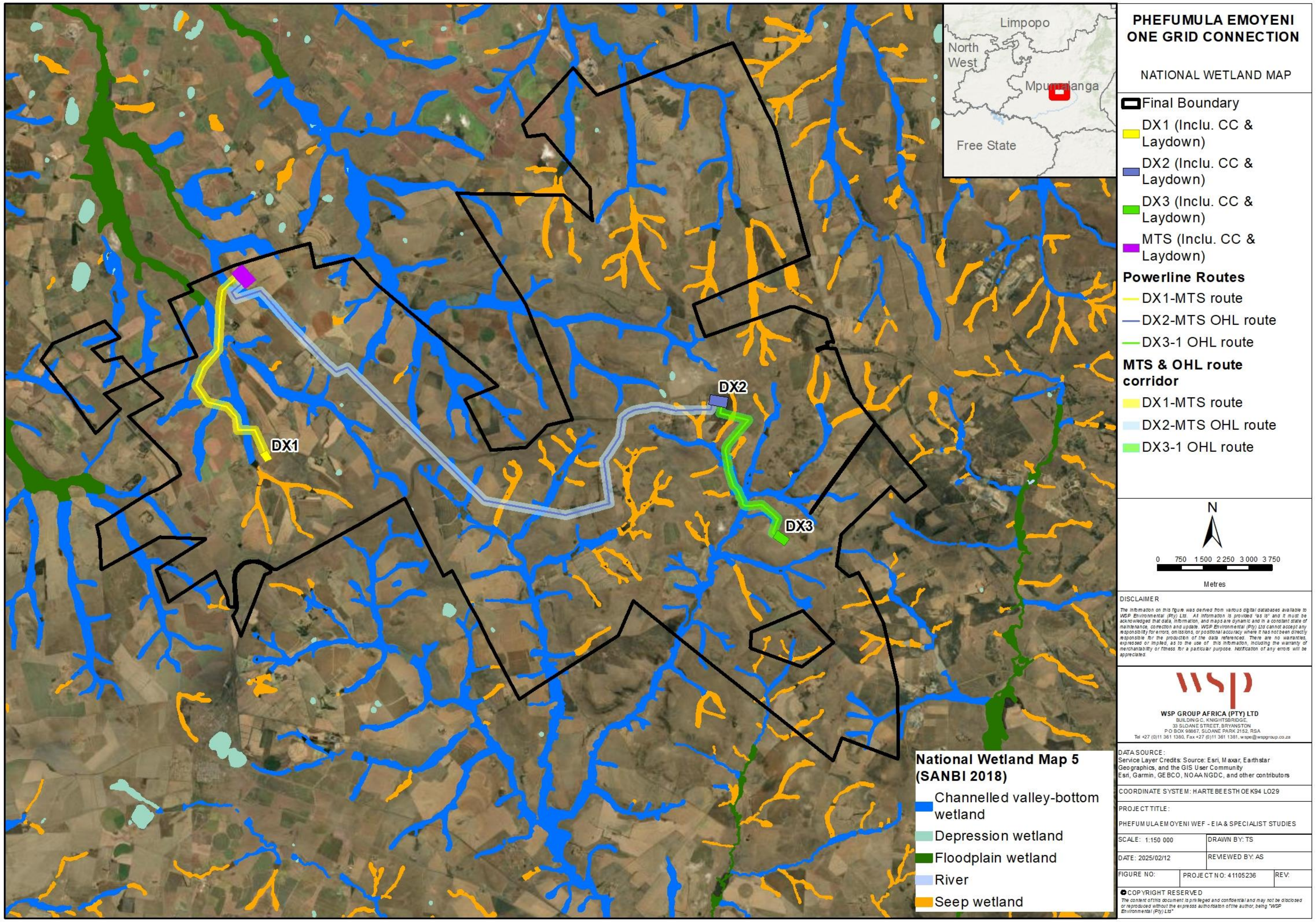

Figure 4-6 – Local surface drainage lines and hydrological features in relation to Phefumula Emoyeni One grid connection infrastructure

4.5 VEGETATION CHARACTERISTICS

The original vegetation cover across large parts of the site and surrounding study area have been converted to planted cropland (Figure 4-7) or are used for grazing (Figure 4-8). However, the vegetation along most waterways, low-lying areas, and many ridges is still largely untransformed, and characterised predominantly by indigenous species interspersed by isolated clumps of wattle, eucalyptus, and other invasive species. The area is typical of the central Highveld, and from a distance forms a visual patchwork of textures and colours (Figure 4-9). The predominant grassland cover is also characterised by a marked change in appearance from summer to winter, as grasses change from green to brown (refer to Section 4.7). Taller trees such as planted oaks and clumps of eucalyptus and pines form prominent features when displayed against the horizon (Figure 4-10).

Figure 4-7 - Large parts of the study area have been converted to planted cropland

Figure 4-8 – A significant percentage of the study area is also used for livestock grazing

Figure 4-9 – From a distance the vegetation cover forms a visual patchwork of textures and colours

Figure 4-10 – Tall planted trees such as oaks, eucalyptus and pines form prominent features when displayed against the horizon

4.6 LAND COVER AND LAND USES

The land cover of the site and surrounding area is shown on Figure 4-13. Large parts of the overall project site are essentially undeveloped or used for extensive agricultural practices, with farmsteads, smallholdings, numerous dams, and several gravel roads being the most prominent infrastructure. The site is also bounded by the N11 highway to the east, and several high-mast power lines (Figure 4-11) and radio towers (Figure 4-12) also occur within the site, although the latter are not prominent in medium-range views. Other large roads in the study area include the N17 highway to the south and R38 west and north of the site.

Figure 4-11 - High-mast power lines traverse parts of the project site

Figure 4-12 – Several tall telecommunication towers are also located within the site, although these are not prominent in medium-range views – pictured here is the project meteorological measurement mast (red arrow)

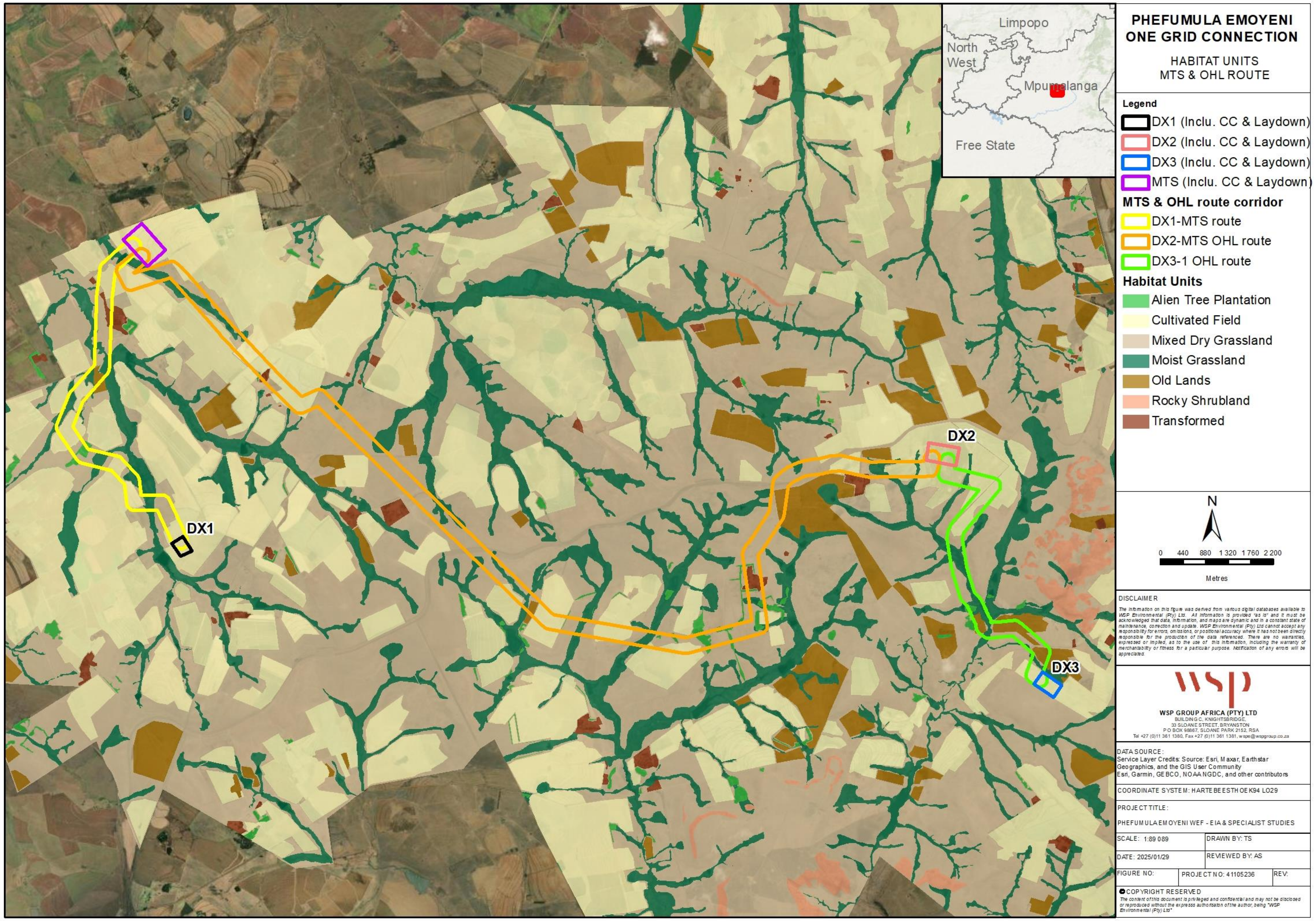

Figure 4-13 - Land cover in the study area and the surrounding landscape in relation to the Phefumula Emoyeni One Grid connection infrastructure

4.7 SEASONAL AND ATMOSPHERIC CONDITIONS

A further aspect of the visual baseline that needs to be considered is that of weather-related/atmospheric conditions and seasonal variations. Prevailing atmospheric conditions can greatly influence how a landscape is perceived by viewers, as well as the range over which views are possible.

The study area is located in a summer rainfall region, and while winters are cold and mostly dry, mist is common particularly during winter, greatly reducing visibility when it is present. Airborne pollution in the region can be high, often resulting in hazy atmospheric conditions. Fires can also significantly impact visual conditions, causing vast and highly visible smoke columns which greatly reduce the visibility in short-range views.

In addition, seasonal changes greatly change the appearance of most landscapes, with the Highveld region typically alternating from vast expanses of various hues of green during the rainy season, to more subdued browns and tans during the winter (Figure 4-14). Croplands also change in appearance, from bare earth at the start of the spring planting season to visually uniform fields of corn during summer, which gradually brown and yellow during autumn before harvesting, following which the fields are again characterised by exposed earth and bare stalks (Figure 4-7).

Figure 4-14 – The predominant vegetation cover is characterised by a marked change in appearance from summer to winter, as grasses change from greens to browns and tans

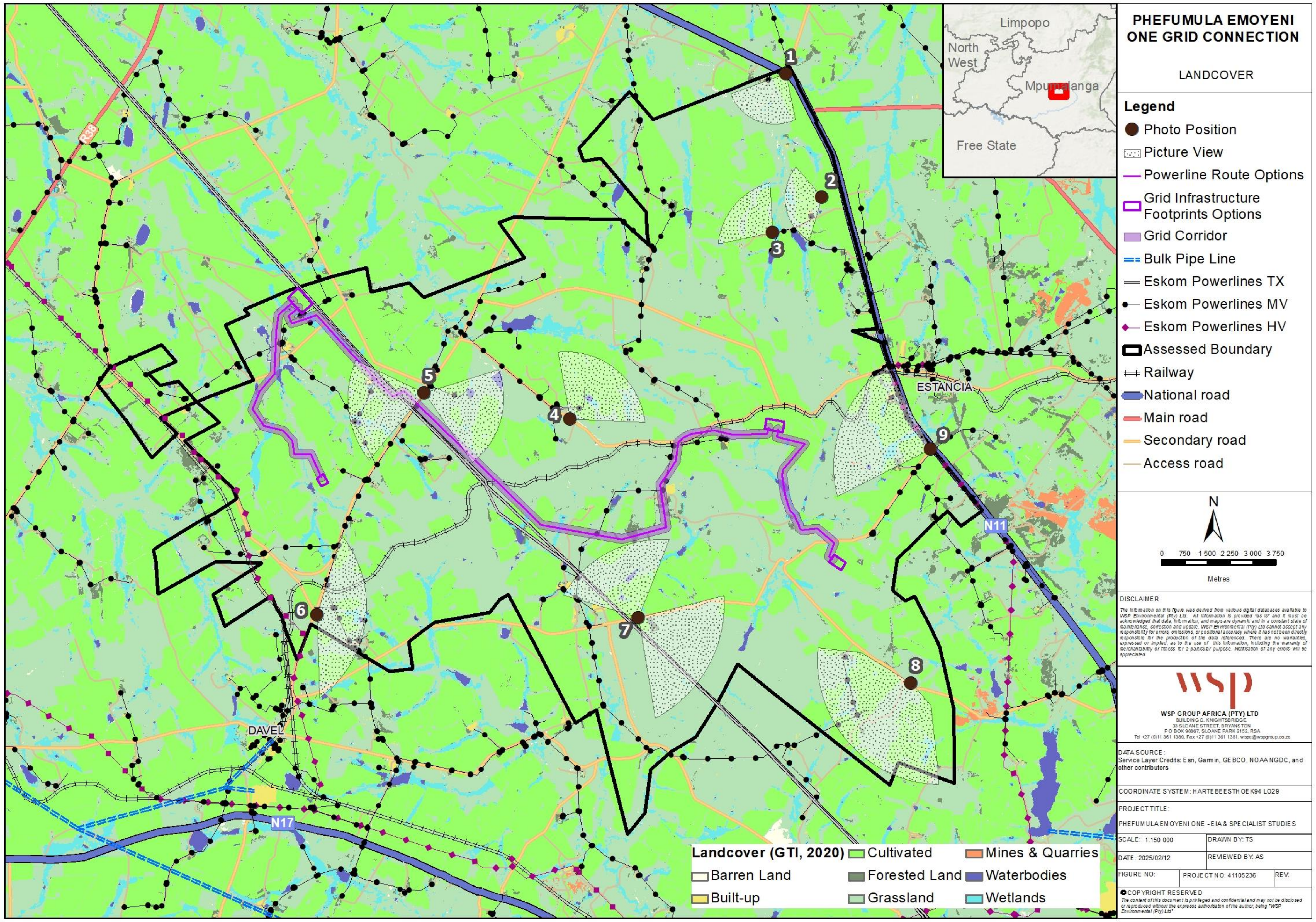

Figure 4-15 - Study area photographs locations in relation to Phefumula Emoyeni One grid connection infrastructure

5 VISUAL RESOURCE VALUE OF THE STUDY AREA

5.1 VISUAL RESOURCE VALUE CRITERIA

Visual resource value refers to the visual quality of elements of an environment, as well as the way in which combinations of elements in an environment appeal to our senses. Studies in perceptual psychology have shown an affinity for landscapes with a higher visual complexity, rather than homogeneous ones (Young, 2004). Furthermore, based on research of human visual preference (Crawford, 1994), landscape quality increases when:

- Prominent topographical features and rugged horizon lines exist;
- Water bodies such as streams or dams are present;
- Untransformed indigenous vegetation cover dominates, and
- Limited presence of human activity, or land uses that are not visually intrusive or dominant prevail.

Further to these factors, Table 5-1 indicates criteria used for visual resource assessment. The assessment combines visual quality attributes (views, sense of place and aesthetic appeal) with landscape character and gives the landscape a very high, high, moderate, or low visual resource value.

A review of the national web-based environmental impact assessment screening tool indicates that the site is not considered sensitive regarding the visual resource. Nonetheless, it recommends that a visual impact assessment be conducted as part of the environmental assessment process.

Table 5-1 - Visual resource value criteria

Visual resource value (sensitivity)	Criteria
Very high (4)	▪ Pristine or near-pristine natural landscape with no or very limited human intervention visible ▪ Natural landscapes characterised by highly scenic or attractive features that are unique to the area or region ▪ Areas that exhibit a strong positive character with valued features that combine to elicit a distinct experience of visual unity, richness, and harmony ▪ Cultural heritage sites, architectural features, or built-up sites comprised completely or mostly consisting of elements of high historical or social value, and that are unique or otherwise characterised by high visual appeal ▪ These landscapes are likely of particular importance to conserve, and are particularly sensitive to change
High (3)	▪ Predominantly natural landscapes that nevertheless have some human interventions visible ▪ Natural landscapes characterised by scenic or attractive natural features, characteristic of the region in which it is located ▪ Areas comprised of visual elements that mostly combine to create a sense of visual unity, richness, and harmony, with minor or isolated incongruent aspects of features ▪ Cultural heritage sites, architectural features, or built-up sites largely characterised by features of high historical or social value, and that mostly have high visual appeal

Visual resource value (sensitivity)	Criteria
	▪ These are landscapes may contain specific features or elements of conservation importance, and which may be sensitive to change
Moderate (2)	▪ Partially transformed or disturbed landscape in which human interventions are visible but do not dominate views ▪ Natural landscapes but with noticeable presence of incongruous elements or degradation of some features ▪ Areas that exhibit some positive visual appeal but that are not unique and are found elsewhere, or that include some disharmonious elements resulting in a more mixed character ▪ Cultural heritage sites, architectural features, or built-up sites characterised by individual elements that have some socio-cultural or historic interest but not considered visually unique ▪ These landscapes are less important to conserve but may still include certain areas or features worthy of conservation, and have some capacity to absorb visual change
Low (1)	▪ Extensively transformed or disturbed landscape ▪ Human intervention is of visually intrusive nature and dominates available views ▪ Scenic appeal of landscape greatly compromised, and visual cohesion of individual elements is mostly non-existent ▪ Built-up sites in which unappealing elements have visual prominence, or that consist of widely disparate or incongruous land uses and activities ▪ Areas generally negative in character with few, if any, valued features. Scope for positive enhancement frequently occurs

5.2 VISUAL RESOURCE VALUE EVALUATION

A summary of the visual resource value of the study area *vis-á-vis* the tabulated factors is discussed below:

- The natural topography of the site and study area is representative of that of the region, and is largely devoid of distinctive landmarks, although larger rises and low ridges do provide some visual variation and create focal points in short range views. The site natural topography is also essentially untransformed, in comparison to areas directly to the east which have notably been transformed by surface coal mining. The site topographical visual resource value is therefore rated as high (3).
- Similarly, the hydrological aspect of the site is undistinctive and visually like that of much of the larger area, although large sections of wetland are still largely intact. The many dams of different sizes do create points of interest and attract birdlife which adds diversity and a dynamic aspect to the site, and the hydrological aspects of the site are therefore rated as being of high (3) visual resource value.
- Given the fact that only a fraction of the once expansive original Highveld grasslands remains, and the further threat posed by mining, agriculture, informal settlement, and associated degradation, the visual resource value of the remaining untransformed sections of the site's vegetation cover is rated as high (3). Similarly, individual clumps and lanes of planted pine and oak trees create points of interest and contribute to the rural character and charm of the area, and also have a high visual resource value.

- The visual resource value of the mostly agricultural land uses and associated land cover of the site, within the context of the larger study area, is considered high (3).

The visual resource value assessment of the site within the context of the study area, in terms of the above criteria scores, is summarised in Table 5-2:

Table 5-2 - Visual resource value determination

Visual baseline attribute	Topography	Water bodies	Vegetation	Land uses
Visual resource value score	3	3	3	3
Total				**12 (high)**

Where:

- 4 – 6 = low
- 7 – 9 = moderate
- 10 – 13 = high
- 14-16 = very high

Based on the above score ranges, the overall visual resource value and sensitivity of most of the site, within the context of the surrounding study area, is rated as high (12).

5.3 VISUALLY SENSITIVE AREAS

Based on the above assessment, the following areas are deemed to have the greatest visual resource value, and all effort should be made to minimise impact to these features as well as rehabilitate disturbances caused during the construction phase:

- Along the tops of ridges and outcrops, as this would fundamentally change their visual character.
- Within delineated wetlands, as the loss of natural vegetation cover would detract from the visual resource value of the area.
- Within 500 m (or other distance specified by the avifauna specialist) of natural pans or the larger dams, as the presence of the individual pylons and other structures near these features would detrimentally impact the sense of place surrounding these, and likely also deter birdlife from accessing these features.

Furthermore, where possible and within the constraints of safety and practical constraints, preference should be given to locating the project infrastructure in the vicinity of existing infrastructure, including near roads, other powerlines, or along the edges of cropland areas.

6 VISUAL ABSORPTION CAPACITY

6.1 VISUAL ABSORPTION CAPACITY CRITERIA

Visual absorption capacity (VAC) can be defined as an “estimation of the capacity of the landscape to absorb development without creating a significant change in visual character or producing a reduction in scenic quality” (Oberholzer, 2008). The ability of a landscape to absorb development or additional human intervention is primarily determined by the nature and occurrence of vegetation cover, topographical character, and human structures.

A further major factor is the degree of visual contrast between the proposed new project and the existing elements in the landscape. If, for example, a visually prominent industrial development already exists in an area, the capacity of that section of landscape to visually “absorb” additional industrial structures is higher than that of a similar section of landscape that is still in its natural state. VAC is therefore primarily a function of the existing land use and cover, in combination with the topographical ruggedness of the study area and immediate surroundings.

Based on the very limited degree of landscape transformation of the site within the study area, the gently rolling topography, and overall lack of distinctive features, vertical elements or landmarks, the VAC of the site is rated as low (Figure 6-1).

Figure 6-1 - The entire site is characterised by low degree of visual absorption capacity

6.2 VISUAL ABSORPTION CAPACITY WEIGHTING FACTOR

To account for the fact that visual impacts are expected to be more intrusive in landscapes with a lower VAC than in those with a higher VAC (regardless of the visual quality of the landscape), a weighting factor is incorporated into the impact magnitude determination, as indicated in Table 6-1. A higher weighting factor is applied to areas with a low VAC to account for the increased visual impact.

Table 6-1 - VAC weighting factor table

Visual resource value of receiving landscape	Low VAC	Medium VAC	High VAC
High/very high resource value	High (1.2)	High (1.2)	Moderate (1.0)
Medium resource value	High (1.2)	Moderate (1.0)	Low (0.8)
Low visual resource value	Moderate (1.0)	Low (0.8)	Low (0.8)

The visual resource value of the study area has been determined to be high (refer to section 5), while the VAC of the study area has been rated as low (see above). Hence, a high (1.2) weighting factor in terms of VAC is applied during the impact assessment.

7 VISUAL RECEPTORS

7.1 RECEPTOR GROUPS

Visual impact is primarily concerned with human interest. Potential viewers, or visual receptors, thus constitute people that might see and be affected by the proposed development. Receptor sensitivity refers to the degree to which an activity is expected to impact receptors, and depends on:

- The various groups of people (visual receptor groups) that occur within the project study area.
- How many people will see and be impacted by the project.
- How frequently they are expected to be exposed to the project.
- Their perceptions regarding the aesthetics of the existing visual context.

Visual receptors of the proposed project can be broadly categorised into two main groups, namely:

- People who live or work in the area, and who will be continuously or frequently exposed to the project components (resident receptors).
- People who travel through the area and are only temporarily exposed to the project components (transient receptors).

Receptors in the study area potentially include the following groups:

- Residents of the various farmsteads and smallholdings on or within viewing distance of the site, and workers at these establishments (resident receptors).
- People working at the various mines that occur east of the site, and other agricultural and commercial establishments surrounding the site (resident receptors).
- Residents of and visitors to the towns and associated settlements potentially within sight of the site (resident and transient receptors).
- Other travellers along the various national and regional roads, and other asphalt and gravel roads surrounding the site (transient receptors).

The degree to which these receptors will be impacted by the project will be dependent on the level of visibility of the project components within the project study area, which will be further assessed during the impact assessment phase.

7.2 RECEPTOR SENSITIVITY

The visual receptor sensitivity and incidence can be classified as high, moderate, or low, as indicated in Table 7-1.

Table 7-1 - Visual receptor sensitivity criteria

Number of people that will see the project (incidence factor)	
Large	Towns and cities, along major national roads (e.g. thousands of people)
Moderate	Villages, typically less than 1 000 people
Small	Less than 100 people (e.g. a few households)
Receptor perceived landscape value (sensitivity factor)	
High	People attach a high value to aesthetics, such as in or around a game reserve or conservation area, and the project is perceived to impact significantly on this value of the landscape.
Moderate	People attach a moderate value to aesthetics, such as smaller towns, where natural character is still plentiful and in close range of residency.
Low	People attach a low value to aesthetics, when compared to employment opportunities, for instance. Environments have already been transformed, such as cities and towns.

The following ratings have been applied to the identified visual receptor groups:

- Resident receptors: Resident receptors comprise at least a moderate to possibly large number of people (incidence factor) living and/or working in the study area. We advance that considering the low existing levels of development associated with the rural setting, a notable contingent of this receptor group will probably attach a high value (vulnerability factor) to the visual appearance of the project site.
- Transient receptors: People travelling through the study area will include residents, itinerant workers, regional tourists, and people on route to towns in the area, or destinations elsewhere. Given the proximity of numerous towns and the fact that the site is bordered by the N11 it is likely that many people (incidence factor) see the site on a frequent basis. It can be assumed that different people within this receptor group will have widely divergent views on the value of the site and surroundings as a visual resource, which will largely be determined by their relation to the area. To account for this degree of variability, it is assumed that this group on a whole will on average attach at least a moderate degree of value to the proposed project site (vulnerability factor).

Based on the above, a comparatively large number of people (incidence factor) are expected to be visually affected by the project, and that the perceived landscape value (vulnerability factor) is expected to vary from moderate to high, depending on the relationship of the individual receptor with the area.

7.3 RECEPTOR SENSITIVITY WEIGHTING FACTOR

To determine the magnitude of a visual impact, a weighting factor that accounts for receptor sensitivity is determined (Table 7-2), based on the number of people that are likely to be exposed to a visual impact (incidence factor) and their expected perception of the value of the visual landscape and project impact (vulnerability factor).

Table 7-2 - Receptor sensitivity criteria weighting factor

Receptor perceived landscape value (vulnerability factor)	Number of people that will see the project (incidence factor)		
	Large	**Moderate**	**Small**
High	High (1.2)	High (1.2)	Moderate (1.0)
Moderate	High (1.2)	Moderate (1.0)	Low (0.8)
Low	Moderate (1.0)	Low (0.8)	Low (0.8)

Based on the receptor sensitivity assessment and the above criteria, a high weighting factor (1.2) in terms of this aspect will be applied during the impact magnitude determination.

8 PROJECT ALTERNATIVES

The layout alternatives for the project are limited and largely constrained to relatively minor variations of sections of the overall power line alignment (options 1 and 2 of DX3 of the overhead power line as illustrated by Figure 1-2), as well as the positions of individual pylons and other structures. In principle, the preferred OHL alignment would avoid any areas of natural grassland, areas of topographical interest, or other visually appealing landmarks such as water bodies.

In this regard, there is therefore little that would favour any of the alignment alternatives being considered for the project. From a visual perspective the individual locations of the respective grid infrastructure elements will have little influence on the overall visual impact caused by the project, as these will appear as a connected visual pathway in the landscape. Nevertheless, where possible, locating the pylons and other structures on top of ridges, within primary grasslands, delineated wetland areas or within proximity of any of the larger water bodies should be avoided.

The alternative of utilising ready-mix concrete trucks instead of the temporary cement batching plant would be favoured, as the batching plant would for the duration of its presence negatively impact the visual character of the area in which it is located. Furthermore, it is reasonable to assume that the appearance of the area in which the plant is located would be permanently altered to some degree despite the implementation of rehabilitation measures.

From a visual perspective, the “no-go” alternative, i.e. whereby the PEO WEF and associated grid connection infrastructure will not be developed, would in principle be favoured, as this would mean that none of the visually detrimental elements would be introduced into the landscape and thereby retaining the existing visual resource value of the project site. However, the significance of the site as a visual asset needs to be weighed against other socio-economic considerations, such as the current and future energy requirements of the nation, to determine whether the proposed project should be supported. Furthermore, several other similar projects are also planned and, in some instances, already approved for development in the region, which means that the visual character of the area will be changing significantly in the near future.

9 IMPACT ASSESSMENT

9.1 IMPACT IDENTIFICATION

The following potential visual impacts that may occur during the construction, operational and decommissioning/closure phases of the project were identified. The expected visual impacts of the construction and decommissioning phases will be assessed together, as they will largely be the same, albeit with the latter essentially occurring in reverse:

9.1.1 CONSTRUCTION AND DECOMMISSIONING PHASE IMPACTS

- Presence of visually intrusive construction/decommissioning related activities and equipment in the landscape.
- Airborne dust due to construction/decommissioning activities and resultant dust settling onto surrounding landscape.

9.1.2 OPERATIONAL PHASE IMPACTS

- Reduction in visual resource value due to the presence of visually intrusive elements, notably:
  - 400 kV transmission line and associated pylons;
  - 132 kV transmission lines and associated pylons; and
  - Main transmission substation and distribution substations pylons.

Figure 9-1 provides an indication of the appearance of typical transmission lines, pylons and substation infrastructure in a rural landscape setting.

- Light pollution at night due to safety and security lighting.

Figure 9-1 - Example of typical transmission line and substation infrastructure in a rural setting (Gopa-intec, 2024)

9.2 IMPACT MAGNITUDE CRITERIA

The magnitude of the identified visual impacts was determined by considering the visual resource value and VAC of the landscape in which the project will take place, and the receptors potentially affected by it, together with the level of visibility of the project components, their degree of visual intrusion and the potential visual exposure of receptors to the project, as further elaborated on below:

9.2.1 THEORETICAL VISIBILITY

The level of theoretical visibility (LTV) is defined as the sections of the study area from which the proposed project infrastructure may be visible and will be performed during impact assessment. This was determined to inform the impact assessment phase by conducting a viewshed analysis and using Esri ArcGIS for Desktop software, 3D Analysist Extension (Geographic Information System software with three-dimensional topographical modelling capabilities).

The basis of a viewshed analysis is a Digital Elevation Model (DEM). The DEM for this viewshed analysis was derived from contour sets for the site, as well as national 5 m contour lines. A 5 km study area surrounding the grid infrastructure was used for the analysis. The viewshed was developed for the transmission line alignment assuming a “worst-case” scenario height of 48 m, which accounts for the pylon tower height, and transmission lines spanning in between these. In addition, the viewsheds of the other project infrastructure was modelled using an assumed average height of 6 m. The viewshed analysis was cumulatively generated along the entire alignment (Figure 9-2), as the locations of individual pylons have not been finalised.

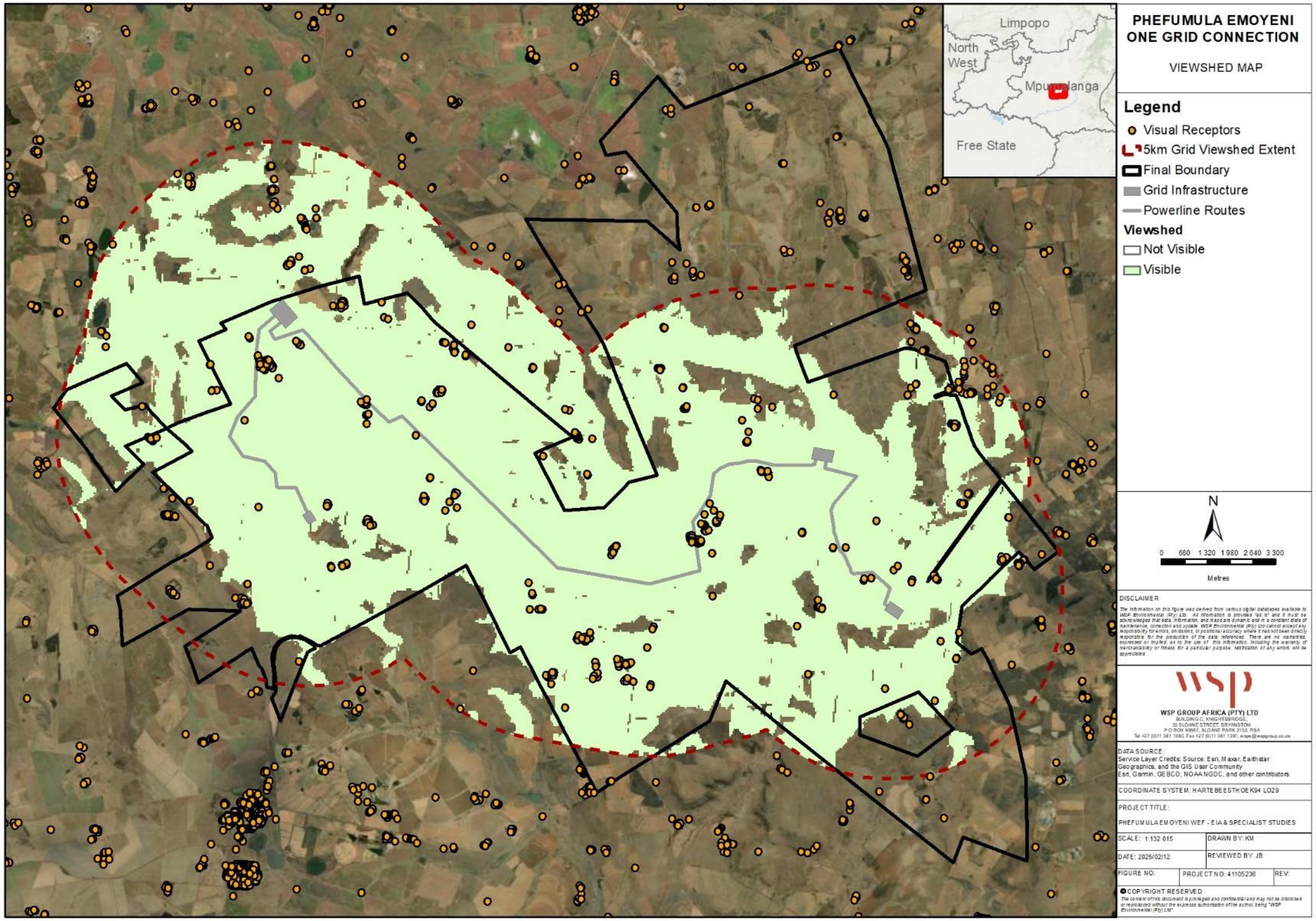

Figure 9-2 - Viewshed of the Phefumula Emoyeni One grid infrastructure

Artificial landforms and structures, such as berms, stockpiles, buildings, and indeed tall vegetation (particularly alien tree windrows and plantations) are not reflected in the DEM. However, given the largely uniform, low vegetation height and the limited development within study area and the great height of the pylons, the influence of these factors on the results of the viewshed analysis are expected will be negligible.

The LTV based on the results of the viewshed analysis was then rated according to Table 9-1.

Table 9-1 - Level of visibility rating

Level of theoretical visibility of project element	Visibility rating
Less than a quarter of the total project study area	Low (1)
Between a quarter and half of the study area	Moderate (2)
More than half of the study area	High (3)

Based on the outcome of the viewshed analysis, which shows that the pylons and power lines will essentially be visible from within almost the entire study area, the LTV is rated as high (3).

9.2.2 VISUAL INTRUSION

Visual intrusion deals with how well the project components fit into the ecological and cultural aesthetic of the landscape as a whole. An object will have a greater negative impact on scenes considered to have a high visual quality than on scenes of low quality because the most scenic areas have the "most to lose". The visual impact of a proposed landscape alteration also decreases as the complexity of the context within which it takes place, increases. If the existing visual context of the site is relatively simple and uniform any alterations or the addition of human-made elements tend to be very noticeable, whereas the same alterations in a visually complex and varied context do not attract as much attention. Especially as distance increases, the object becomes less of a focal point because there is more visual distraction, and the observer's attention is diverted by the complexity of the scene (Hull and Bishop, 1998). The expected level of visual intrusion of each of the project components will be evaluated based on these factors during impact assessment.

9.2.2.1 Construction and decommissioning phase impacts

- Presence of visually intrusive construction/decommissioning related activities and equipment in the landscape – The construction site will contain various machinery, laydown areas with materials and equipment, movement of vehicles, and the increasing presence of the transmission lines and other infrastructure under construction will be characterised by a profusion of shapes, colours, and textures and a high level of activity. This will contrast dramatically with the rural setting which is visually largely homogenous and of a low VAC. The level of visual intrusion of this aspect of the construction and decommissioning phases is expected to range from moderate to high (3).
- Airborne dust due to construction/decommissioning activities and resultant dust settling onto surrounding landscape – dust clouds can be particularly visible and intrusive impacts associated with construction activities, due to their vertical height and contrast with the surrounding sky. However, the proposed project will not involve extensive earthworks or result in large-scale denuded areas, and conversely therefore also not result in excessive dust fallout on surrounding

areas. The level of visual intrusion from dust related impacts during construction and decommissioning is therefore expected to be low (1).

9.2.2.2 Operational phase Impacts

- Reduction in visual resource value due presence of visually intrusive pylons, transmission lines, and other project infrastructure in the landscape –the transmission pylons will be tall and contrast with the surrounding rolling landscape character, although it must be noted that the transmission infrastructure will be dwarfed by the much taller wind turbines of the main WEF project, that would form the most visually prominent elements in the landscape. The geometric shapes and reflective surfaces of the individual pylons will also contrast with the largely undeveloped surrounding rural context. The level of visual intrusion of the pylons, substations and other infrastructure during operations is therefore rated as moderate (2).
- Light pollution at night due to security lighting – the impact of night-time illumination can be particularly egregious, specifically in areas with low existing levels of existing point-source (direct) and to a lesser extent ambient (indirect, reflected) light levels. The intensity of the impact of light at night is a further function of the brightness, direction, elevation, occurrence (flickering vs. constant) and colour of the light. The proposed project is in a low-development area, with relatively limited existing direct light sources, and ambient light expected mainly from the southeast from the town of Ermelo. The overall level of lighting is however expected to be low when compared to more intensive industrial developments and urban areas and will largely be limited to security lighting of the substations. For this reason, the visual intrusion of night-time light is expected to be low (2).

9.2.3 VISUAL EXPOSURE

The visual impact of a development diminishes at an exponential rate as the distance between the observer and the object increases – refer to Figure 9-3. Relative humidity and fog in the area directly influence the effect. Increased humidity causes the air to appear greyer, diminishing detail. Thus, the impact at 1 000 m would be 25% of the impact as viewed from 500 m. At 2 000 m it would be 10% of the impact at 500 m. The inverse relationship of distance and visual impact is well recognised in visual analysis literature (Hull and Bishop, 1998) and was used as important criteria for this study.

Thus, visual exposure is an expression of how close receptors are expected to get to the proposed interventions on a regular basis. For the purposes of this assessment, close range views (equating to a high level of visual exposure) are views over a distance of 500 m or less, medium-range views (equating to a moderate/medium level of visual exposure) are views of 500 m to 2 km, and long-range views are over distances greater than 2 km (low levels of visual exposure).

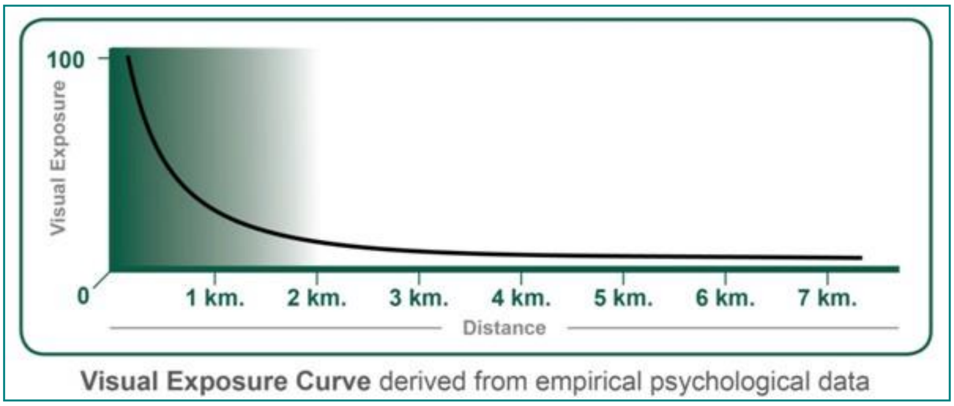

Figure 9-3 - Visual exposure graph

The level of visual exposure of the turbines and other infrastructure was evaluated within this context for the respective project phases.

9.2.3.1 Construction, operational and decommissioning phase impacts

- All identified impacts: the distance between individual pylons, transmission lines, and substations and individual receptors and the resultant degree of visual exposure will vary considerably, as a function of relative location of each within the study area. However, at their closest several receptors will likely be located within 500 m of the transmission corridor, and the level visual exposure is therefore expected to range from moderate to high, and has been conservatively rated as high (3).

9.3 IMPACT MAGNITUDE METHODOLOGY

The expected impact magnitude of the proposed project will be rated, based on the above assessment of the visual resource value of the site, as well as level of visibility, visual intrusion, visual exposure and receptor sensitivity as visual impact criteria. The process is summarised below:

Magnitude = [(*Visual quality of the site x VAC factor*) *x* (*Visibility* + *Visual Intrusion* + *Visual Exposure*)] *x Receptor sensitivity factor*.

Thus: [(*1 x Factor 1.0*) *x* (*1 + 1 + 1*)] *x Factor 1 = 3.*

From the above equation the maximum magnitude point (MP) score is 51.8 points. The possible range of MP scores is then categorised in terms of magnitude rating as indicated in Table 9-2.

Table 9-2 - Impact magnitude points score range and magnitude rating

MP score	Magnitude rating
>34.5	Very high: Permanent cessation of processes
26 - 34.5	High: Processes temporarily cease
17.5 – 25.9	Medium: Processes continue but in a modified way
9 – 17.4	Low: Slight impact on processes
<8.9	Very low: No impact on processes

9.4 IMPACT MAGNITUDE DETERMINATION

Based on the visual resource, VAC, receptor sensitivity and impact assessment criteria assessed in the preceding sections, the magnitude of the various impacts identified was determined for each phase of the project. Consequently, the impact magnitude determination for the construction and operational phases and for the closure phase is presented in Table 9-3.

Table 9-3 - Determination of impact magnitude

Visual impact	Study area visual resource value	VAC weighting factor	Level of visibility	Visual intrusion	Visual exposure	Receptor sensitivity factor	Total impact magnitude points	Impact magnitude rating
Construction and decommissioning phases impacts								
Presence of visually intrusive construction/decommissioning related activities and equipment in the landscape	3	1.2	3	3	3	1.2	38.88	Very high (5)
Airborne dust due to construction/decommissioning activities and resultant dust settling onto surrounding landscape	3	1.2	3	1	3	1.2	30.24	High (4)
Operational phase impacts								
Reduction in visual resource value due presence of visually intrusive infrastructure in the landscape	3	1.2	3	2	3	1.2	34.56	Very high (5)
Light pollution at night due to security lighting	3	1.2	3	1	3	1.2	30.24	High (4)
Where for: visual resource value very high=4, high=3; moderate=2; low=1; visibility, visual intrusion, and visual exposure: high=3; moderate=2; low=1; VAC and receptor sensitivity: high = factor 1.2; moderate = factor 1; low = factor 0.8								

9.5 IMPACT ASSESSMENT RATING METHODOLOGY

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, as relevant/feasible.

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 will consider the following impacts:

- direct - impacts that arise directly from activities that form an integral part of the Project
- indirect - impacts that arise indirectly from activities not explicitly forming part of the Project
- secondary - induced impacts caused by a change in the Project environment
- cumulative - impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects

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 presented in Table 9-4. 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.

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 presented in below:

Table 9-4 - Impact assessment criteria and scoring system

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
Impact agnitude (M) The degree of alteration of the affected environmental receptor	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	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
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

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
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 to 15	16 to 30	31 to 60	61 to 80	81 to 100
Environmental Significance rating (negative (-))	Very low	Low	Moderate	High	Very high
Environmental significance rating (positive (+))	Very low	Low	Moderate	High	Very high

9.6 DETERMINATION OF IMPACT SIGNIFICANCE

An impact assessment of the visual impacts identified has been conducted as summarised in Table 9-5. The impact significance without mitigation measures is re-assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified, noting that the feasibility of visual impact mitigation is limited. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during project implementation to verify that actual impacts are the same as those predicted in this report. Recommended mitigation measures are discussed in section 10.

- Magnitude: The individual impact magnitude scores and ratings are reflected in Table 9-3
- Extent: All visual impacts associated with all phases of the project are expected to be of regional scale (3), as the impact will extend beyond the site boundaries to the immediate surroundings, but will not extend or otherwise be significant on a larger (i.e. municipal, provincial) scale. The only exception here is shadow flicker, which will only be experienced at a highly localised scale (2)
- Reversibility:
  - Transient impacts such as airborne dust are considered reversible (1), as the visual impact ceases once the caused has ended
  - Construction-related impacts are recoverable (3), as most of the impacts associated with this phase will cease once construction has ended and will transform into operational phase impacts

once the infrastructure has been fully erected. The visual impacts of the construction phase can also be reduced through appropriate management and mitigation, albeit to a limited extent

- The operational phase visual impacts are largely irreversible (5), as they will continue to persist and remain unchanged for the entire duration of the operation phase, and limited to no mitigation (depending on the impact) is likely to be feasible. The exception here is light pollution at night due to project site security lighting, where a measure of operational and siting, and design mitigation respectively, may be possible (3)

- Duration:
  - Most construction and decommissioning phase impacts, the duration was assumed to be short-term (2), as a function of how long the construction and decommissioning phases respective are expected to last
  - However, the visual impact of airborne dust is immediate (1) as the impact ceases as soon as the dust plume has dissipated, and dust settled
  - Operational-phase impacts will be a function of the lifespan of the project, and have therefore been rated as long-term (4)
- Probability:
  - All direct visual impacts caused by the presence of the project infrastructure in the landscape, including the presence of construction machinery and activities, have been rated as highly probable (4), as these impacts are a given if the project is implemented and aonly offset by the fact that the infrastructure is less visible over distance than for instance the associated WEF infrastructure, which is visually more substantial
  - Indirect/associated impacts, such as airborne dust during construction/decommissioning, are rated as having a high probability (4), as they can be reasonably expected to occur, but are not guaranteed

Table 9-5 – Impact assessment

Impact number	Aspect	Description	Character	Ease of mitigation	Pre-mitigation							Post-mitigation						
					(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating
Construction and decommissioning																		
Impact 1:	Airborne dust	Airborne dust due to construction/decommissioning activities and resultant dust settling onto surrounding landscape	Negative	moderate	4	3	1	1	4	**36**	**N3**	3	3	3	1	2	**20**	**N2**
				Significance	**N3 - Moderate**							**N2 - Low**						
Impact 2:	Construction activities	Presence of visually intrusive construction/decommissioning related activities and equipment in the landscape	Negative	low	5	3	3	2	4	**52**	**N3**	3	3	3	2	4	**44**	**N3**
				Significance	**N3 - Moderate**							**N3 - Moderate**						
Operations																		
Impact 3:	Presence of pylons, other infrastructure	Reduction in visual resource value due to presence of visually intrusive pylons and other project infrastructure in the landscape	Negative	none	5	3	5	4	4	**68**	**N4**	5	3	5	4	4	**68**	**N4**
				Significance	**N4 - High**							**N4 - High**						
Impact 4:	Light pollution	Light pollution at night due to project site security lighting	Negative	low	4	3	3	4	4	**56**	**N3**	2	3	3	4	4	**48**	**N3**
				Significance	**N3 - Moderate**							**N3 - Moderate**						

10 RECOMMENDED MITIGATION MEASURES

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in Figure 10-1.

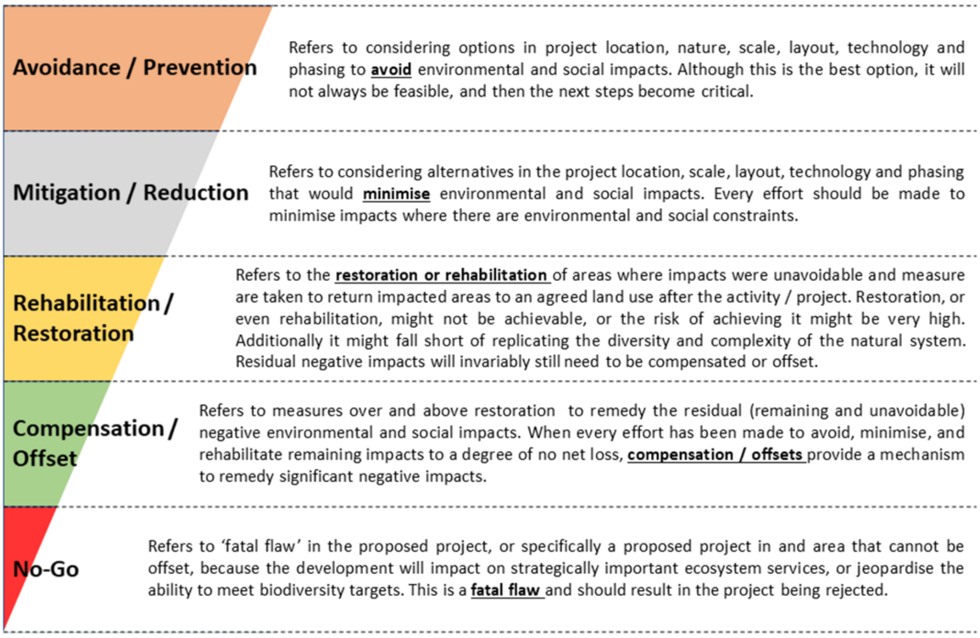

Figure 10-1 - Risk mitigation hierarchy

Where avoidance is not possible, visual mitigation for operational facilities can be approached in two ways, and usually a combination of the two methodologies is most effective. The first option is to implement measures that attempt to reduce the visibility of the sources of a visual impact. Thus, an attempt is made to "hide" the source of the visual impact from view, by placing visually appealing elements between the viewer and the source of the visual impact. The second option aims to minimise the degree or severity of the visual impact itself, and usually involves altering the source of the impact in such a way that it is smaller in physical extent and/or less intrusive in appearance.

In the case of the PEO grid connection infrastructure, visual mitigation options are very limited or even impossible due to several factors, i.e.:

- The vast horizontal scale of the project infrastructure
- The requirement for unobstructed safety corridors to access transmission lines, and space constraint
- Technology and operational requirements and constraints

The proposed visual mitigation measures for the construction and decommissioning, and operational phases respectively, are presented in Table 10-1.

Table 10-1 - Recommended preliminary mitigation measures for visual impacts

Component	Mitigation measures
Construction and decommissioning phases	
Airborne dust due to construction/decommissioning activities and resultant dust settling onto surrounding landscape	Dust control: ▪ Water down construction roads and large bare areas as frequently as is required to minimise airborne dust ▪ Enforce a 40 km/h speed limit on site for all vehicles ▪ Monitor dust fallout if any complaints are received, using appropriate dust monitoring programme
Presence of visually intrusive construction/decommissioning related activities and equipment in the landscape	Site management: ▪ Ensure all construction areas are appropriately maintained and kept in tidy order ▪ Reduce the number and size of material laydown and waste storage areas to the extent feasible, and barricade these from view with shade netting/similar if needed ▪ Remove accumulated waste material and unused equipment from site as frequently as is feasible ▪ Repair unsightly and ecologically detrimental erosion damage to steep or bare slopes as soon as possible and re-vegetate these areas using a suitable mix of indigenous grass species
Operational phase	
Reduction in visual resource value due to presence of visually intrusive project infrastructure in the landscape	▪ Employ micro-siting and orientation infrastructure to avoid sensitive areas ▪ Rehabilitate disturbed areas as soon and as comprehensively as possible
Light pollution at night due to security lighting	▪ Utilise security lighting that is movement activated rather than permanently switched on, to prevent unnecessary constant illumination ▪ Plan the lighting requirements of the facilities to ensure that lighting meets the need to keep the site secure and safe, without resulting in excessive illumination ▪ Reduce the height and angle of illumination from which lights are fixed as much possible while still maintaining the required levels of illumination ▪ Identify zones of high and low lighting requirements, focusing on only illuminating areas to the minimum extent possible to allow security surveillance

Component	Mitigation measures
	▪ Avoid up-lighting of structures by rather directing lighting downwards and focussed on the area to be illuminated ▪ Fit all security lighting with 'blinkers' or specifically designed fixtures, to ensure light is directed downwards while preventing side spill. Light fixtures of this description are commonly available for a variety of uses and should be used to the greatest extent possible

11 CUMULATIVE IMPACT ASSESSMENT

A cumulative impact assessment is the process of (a) analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen Valued Environmental and Social Components (VECs) over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible (IFC GPH).

Sadler (1996) defines cumulative impacts as the "the net result of environmental impact from a number of projects and activities". Further, cumulative in relation to an activity, means the "past, current, and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities" (2014 EIA Regulations, GNR 982).

Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed PEO grid connection infrastructure. While one project may not have a significant negative impact on sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts.

Therefore, the presence of existing electrical distribution infrastructure within the study area, together with several renewable energy developments within the surrounding area which have submitted applications for environmental authorisation (some of which have been approved and others now operational), have been considered. It is important to note that the existence of an approved EA does not directly equate to actual development of the project.

The following renewable energy projects and OHL (Figure 11-1) are located within a 55 km radius of the site and have been considered in the preliminary cumulative impact assessment. It is also noted that the proposed PEO grid connection infrastructure is not located within one of the promulgated Renewable Energy Development Zones (REDZ).

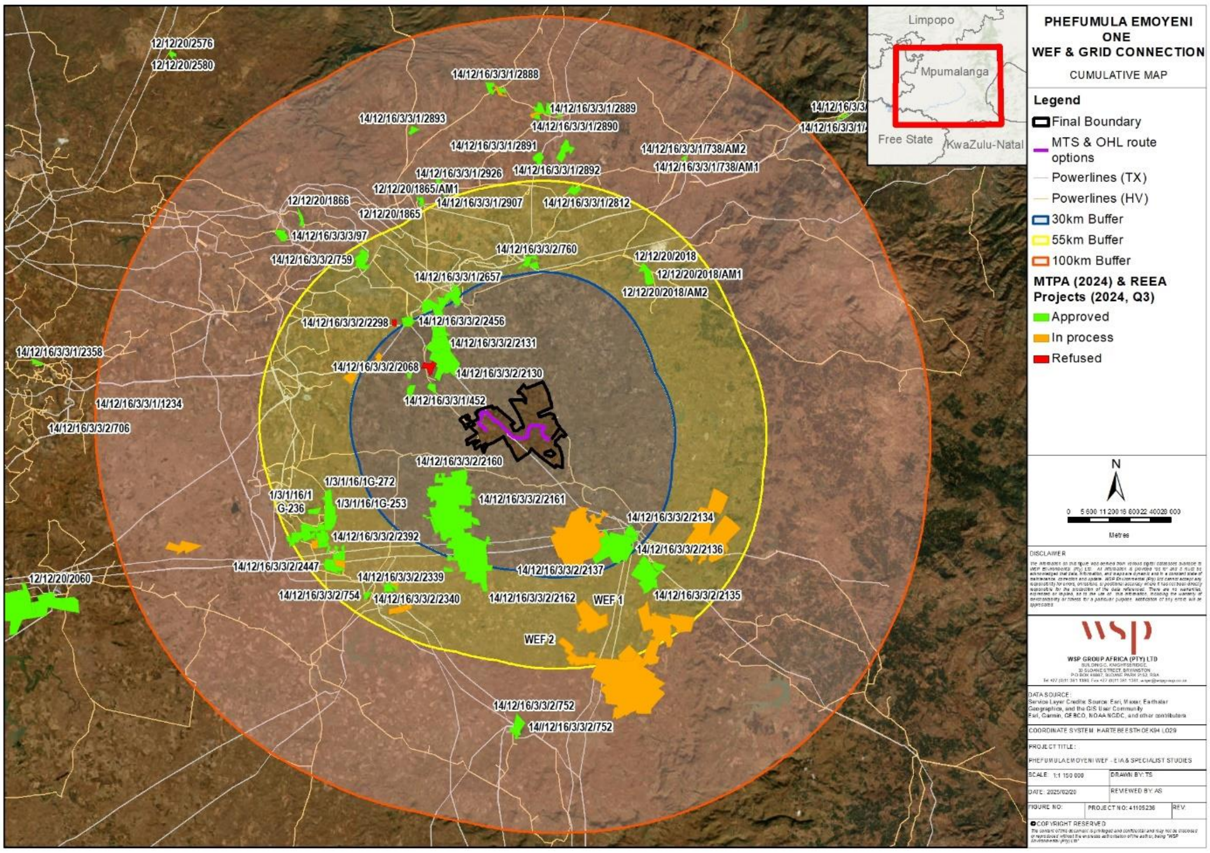

Figure 11-1 - Phefumula Emoyeni One cumulative impacts from existing and proposed renewables projects and overhead power lines

The proposed PEO grid infrastructure will be located in a largely agricultural and rural setting, characterised by moderate to high visual resource value. Several other proposed renewable projects that range from comparatively small to expansive in scale are located north, west and south of the PEO site, with multiple OHL traversing the western, northern and southern quadrants of the 55 km radius surrounding the PEO site. However, the proposed PEO grid connection infrastructure will be comparatively limited in extent when compared with existing OHL and planned renewables projects, as well as the PEO WEF project itself.

The cumulative visual impact of the project is assessed below:

- Magnitude: Numerous other future projects of a similar nature may take place in the region, several of which could be within visible distance of the PEO grid infrastructure. However, only a very small percentage of the overall project footprint area will physically be transformed as part of the project. From a visual perspective the development will be visible from within a much larger percentage of the cumulative impact assessment study area, and the project viewshed may also partially overlap with that of other proposed WEFs, but the visual impact of the power lines over distance is expected to be much less significant than that of the WEF project and will be modest compared to that of existing OHLs. For these reasons, the magnitude of the cumulative visual impact of the project is estimated to be low (1)

- Extent: The cumulative visual impact will be of regional scale (3), as the impact will extend beyond the site boundaries to the regional surroundings, but is not expected to be significant on a larger (i.e. provincial) scale
- Reversibility: The visual impacts associated with the project once constructed will persist and remain unchanged for the entire duration of the operation phase, as will be the case with other projects of a similar nature if approved, and in most instances limited to no mitigation (depending on the impact) is likely to be feasible, and therefore deemed irreversible (5)
- Duration: As this is an operational-phase impact that will be present for the lifespan of the project, the duration has been rated as long-term (4)
- Probability: Given the proximity of several of the proposed other developments, the probability of a cumulative visual impact caused by the presence of the project infrastructure in the landscape has been rated as highly likely occurring (4)

Table 11-1 – Cumulative visual impacts

Phase	Potential cumulative visual impacts	Visual significance					
		M	E	R	D	P	S
Operational phase	Further degradation and fragmentation of the existing rural character of the study area through the introduction of an additional expanse of visually intrusive infrastructure into the landscape.	1	3	5	4	4	52 (moderate)

Based on the above assessment, the cumulative visual impact of the project is expected to be moderate.

12 CONCLUSIONS

The project site is located in a largely rural, agricultural setting, with areas of mining development located east of the site. Several large towns are also located further away from the site, within the outer edges of the 10 km study area and beyond. Various other agricultural and commercial land uses also occur in the area. As such, the potential visual receptor base to the proposed development is large and diverse. Furthermore, the visual resource value of the site within the context of the surrounding study area is high, owing mainly to the low prevailing levels of development, topographical character, and presence of various water bodies, and therefore also has a low ability to absorb visual change.

The proposed project will have negative impacts on the visual environment, mainly due to the introduction of very tall, visible, and visually intrusive elements into the landscape, in the form of the transmission line pylons, as well as other associated support infrastructure. The significance of these impacts is expected to be moderate to high in the context of the existing visual setting, and limited visual mitigation is feasible and mainly relevant to the construction and decommissioning phases, as proposed in section 10.

However, the project needs to be considered within the context of the country's worsening energy generation and supply outlook, and the fact that several applications for similar projects have already been lodged and in some instances approved in the area, and accordingly can be supported from a visual perspective.

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Appendix A

SPECIALIST'S CV

Appendix B

VISUAL AND FLICKER SITE SENSITIVITY VERIFICATION REPORT

Appendix C

DOCUMENT LIMITATIONS

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