ENVIRONMENTAL IMPACT ASSESSMENT FOR ESKOM'S NORTHERN KWAZULU-NATAL STRENGTHENING PROJECT

SPECIALIST REPORT: VISUAL IMPACT ASSESSMENT

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On behalf of:
Eskom Holdings Limited SOC Ltd

April 2018

DEA Reference Numbers: 14/12/16/3/3/2/1036, 1037 and 1038

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DECLARATION OF CONSULTANTS' INDEPENDENCE

Johan Goosen and Stephen Townsend (GIS specialist), who are visual impact specialists from Aurecon SA (Pty) Ltd are independent consultants to NAKO ILISO (consultants for ESKOM Holdings SOC Ltd), i.e. they have no business, financial, personal or other interest in the activity, application or appeal in respect of which they were appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of these specialists performing such work.

Signature of Visual Specialist: Johan Goosen

15 April 2018

Date:

ESKOM'S NORTHERN KWAZULU-NATAL STRENGTHENING PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

APPENDIX J: VISUAL IMPACT ASSESSMENT

Title:	Visual Impact Assessment for Eskom's Northern Kwazulu-Natal Strengthening Project Environmental Impact Assessment
Specialists:	J Goosen and S Townshend
Project Name:	Eskom's Northern Kwazulu-Natal Strengthening Project: Environmental Impact Assessment
Status of report:	Draft
NAKO ILISO Project Number:	1600048
Date:	March 2018

SPECIALIST

Approved for Aurecon SA by:

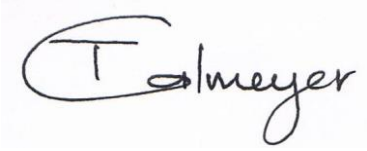
15 April 2018

Mr BHJ Smit — Date

Principal: Environment

ENVIRONMENTAL ASSESSMENT PRACTIONER

Approved for NAKO ILISO by**:**



15 April 2018

Terry Calmeyer — Date

Project Leader

Executive summary

Project description

Eskom Holdings SOC Limited (Eskom) has commissioned an Environmental Impact Assessment (EIA) to investigate the potential environmental impacts of the proposed project to strengthening the supply of electricity to northern KwaZulu-Natal (KZN). The proposed project consists of the new Iphiva 400/132 kV Substation near the town of Mkuze in KZN, which will be integrated into the 400 kV Transmission network by the approximately 150 km Normandie-Iphiva, the 130 km Iphiva-Duma 400 kV Transmission powerlines and approximately 165 km of 132 kV Distribution powerlines that will link into the Iphiva Substation. The EIA is being done in terms of the National Environmental Management Act (No 107 of 1998), in particular Regulations GN. R982, R983, R984 and R985 promulgated in December 2014, as amended.

Terms of Reference

The scope of the study is to define the spatial context of influence of the proposed development/s in terms of the visibility of the overhead powerlines, the substation and to identify potential sensitive receptor locations.

In terms of the Guideline for Involving Visual and Aesthetic Specialist on EIA Processes (Oberholzer, 2005), the depth and scope of a VIA should be based on a combination of the sensitivity of the existing environment and the nature of the development. The type of environment and type of development are both divided into five categories. The proposed development has been categorised as a Category 5 development (large scale infrastructure) and the environment has been categorised as "an area with medium scenic, cultural and historic significance". The development can be expected to result in a development of moderate to high visual impact, which will require a Level 4 visual assessment.

Typically, a Level 4 visual assessment includes the following:

- *Identification of issues raised in the scoping phase, and a site visit;*
- *Description of the receiving environment and the proposed project;*
- *Establishment of view catchment area, and receptors;*
- *Indication of potential visual impacts using established criteria;*
- *Inclusion of potential lighting impacts at night;*
- *Description of alternatives, mitigation measures and monitoring programmes; and*

Approach

The VIA approach is based on Oberholzer (2005). The guideline draws on best practice in EIA and provides guidance applicable to visual specialist assessment. The study will be divided into a baseline phase and an assessment phase.

The baseline phase will describe the visual resource and the technical information associated with the proposed development. The description of the visual resource includes:

- *The baseline conditions in terms of the **landscape character;***
- *The **landscape quality** in terms of the visual absorption capacity and overall aesthetic appeal which included the existing land cover, intrinsic physical properties, landform, vegetation, water, colour, adjacent scenery, scarcity and cultural modifications;*
- *The **visual receptors** and;*
- *The **sense of place**/genius loci*

The technical information focuses on the main project components. The assessment phase consists of the following tasks:

- *Analysis of the proposed development in terms of the criteria such as **visual intrusion**, **visibility**, **visual exposure, visual absorption capacity** and **viewer sensitivity** to determine the **intensity** of the impact. A 3D GIS terrain model will be used to assess the visibility of the infrastructure or parts thereof, from significant viewpoints within the viewshed.*
- *Emphasis will be placed on potential visual receptors and critical views towards the proposed development. Photographs and a GPS will be used to record relevant geographical locations within the vicinity of the corridor. Unique viewpoints will be selected per land uses and different landscape characteristics.*
- *Determine the impact **significance** by synthesising the assessment criteria as described above.*
- *Recommend **mitigation measures** to reduce the potential negative impacts; and*
- *Photomontages will be used to compare the existing views with the probable effect of the proposed infrastructure.*

Gaps and Limitations

The following limitations and assumptions are applicable to this report:

- *Determining a visual resource in absolute terms is not achievable. It is a complex procedure since it is determined through a combination of quantitative (visibility) and qualitative (aesthetic value) criteria. Therefore, a VIA cannot be entirely objective in this sense. Individuals will evaluate a landscape differently, based on experience, culture and social background.*
- *Various factors can enhance or reduce the visual impact of the proposed project, for instance, vegetation near a receptor's view of the proposed project. Other factors include weather, climatic conditions and seasonal change. It is therefore difficult to determine the visual impact of the proposed project from the viewpoint of each individual receptor.*
- *The layouts and technical designs provided are conceptual. Therefore, the possibility of adaption exists. Should there be any significant changes in the designs of the proposed infrastructure, these changes may have to be re-assessed.*
- *The exact position for construction camps and laydown areas are not available at this stage therefore related detailed viewpoints towards the proposed impact cannot be determined.*
- *Access for the visual specialist was denied by the land-owner of the proposed Zimanga Nature Reserve, therefore photos and viewpoints within the reserve was not assess. GPS points of proposed lodge / hide positions was further not received for detailed visibility analysis from these locations to project infrastructure.*

Main characteristics of the study area

Topography

The dominant landscape features are valley slopes to undulating hills and flat plains with a network of trailing rivers and smaller streams. The northern and central parts of the proposed study area are more mountainous and has extreme topographical features. Two extreme areas where topographical features is observed is in the north along the Pongola River and east, close to the N2. Mean elevation ranges from 0 m above mean sea level (mamsl) to 2,000 mamsl above sea level.

Land use / cover

Commercial farming - large sugarcane plantations occur around Pongola as well as an area on the R66 towards Nongoma, where the R66 crosses the Mkhuze River. Croplands coincide with the more evenly sloped areas.

Forestry - Significant forestry areas occur in the following high-lying areas:

- *Areas north of Frischgewaagd; and*
- *Along the R69 to Louwsburg.*

Dispersed rural settlement - informal housing settlements (villages) and single isolated homesteads are scattered throughout the study area, coinciding with subsistence agriculture.

Larger formalised towns - these include Louwsburg, located more towards the west of the study area and Pongola, located towards the north of the study area.

Presence of existing / approved infrastructure – Although not a land use per se, the presence of infrastructure such as roads, rail and existing transmission lines do affect the visual sensitivity of the landscape, especially along the N2.

Conservation / game farming – there are large areas in the study area with formal status under NEM:PAA, and a range of private nature reserves. It follows that these areas have high tourism value within, and bordering the study area.

Vegetation cover

The study area mostly falls within the Savanna biome, gradually moving into the grassland biome towards the west in the vicinity of the Normandie substation. From the site visit it appears that only the formally protected areas and forestry areas still has significant tree cover. Dispersed rural settlement areas, formal towns and sugarcane areas will likely have little screening value in terms of visual impact.

Receptor (viewer) sensitivity

Projects-specific receptor (viewer) sensitivity is discussed here. This understanding of viewer sensitivity is based on accepted international practice, previous experience of the visual specialists, social specialist and the economic specialist.

High viewer sensitivity - Guest houses, game lodges and nature-based tourism in protected areas dependent upon a pristine visual resource for tourism value.

Moderate viewer sensitivity - Rural (commercial farming) homesteads

Low viewer sensitivity - National / provincial road users where other infrastructure is present and transformation has already taken place, Formal settlements (such as Pongola / Mkuze / Ulundi) and informal settlements / villages (likely considers transmission lines as a sign of progress)

Opportunities and constraints

The greatest factor that influenced visual impact for this project was the presence of conservation areas, due to their dependence upon the landscape as visual resource as income generator for tourism-related activities. The avoidance and minimisation of the visual impact was mostly focused around reducing impact on these areas.

Impact assessment

Impacts were identified for each of the viewer groups against each of the infrastructure components. Visibility, visual exposure were combined in the GIS viewsheds generated. These aspects and visual intrusion were combined to calculate the intensity / magnitude of each impact. The visual intensity was then combined with pre-defined impact assessment aspects such as the nature, duration, extent to determine the significance of each impact before and after mitigation.

<u>Preferred alternatives</u>

- *It is recommended that the Iphiva Substation Site 6 alternative should be authorised.*
- *It is recommended that the 400 kV Normandie-Iphiva powerline route Alternative 2 (along the N2) should be authorised.*
- *It is recommended that the 400 kV Iphiva-Duma powerline route Western Alternative (1 or 2) should be authorised.*
- *It is recommended that the following components of 132 kV powerlines should be authorised:*
  - *Pongola/Iphiva (no alternative);*
  - *Iphiva/Hluhluwe (no alternative);*
  - *Candover HV to existing 132 kV powerline (no alternative).*
  - *It is recommended that the Route alternative Iphiva/Makhathini/Mbazwane WEST should be authorised. This relates to the existing land use (mostly farming) and existing other infrastructure (rail and road), thereby consolidating visual impact along one corridor.*

Mitigation measures

Due to the nature of visual impacts, no visual impacts were identified for the operational and rehabilitation phases of the project, hence no visual mitigation measures are required in this section. Construction phase mitigation measures in this section include the pre-construction phase.

The potential visual impacts associated with transmission / distribution powerlines and associated infrastructure are related to alignment close to sensitive areas such as elevated ridges, koppies and wetlands that could be conserved as visual assets for tourist related activities. This was considered in the route selection process, where visual sensitivity was

considered as a constraint to route alignment, thereby meeting the first step in the mitigation hierarchy, namely that of avoidance of the impact. Visual impacts are best mitigated in the planning and design phase, and to a lesser extent the construction phase

Mitigation strategies of visual impacts for this project proposed includes:

<u>Planning and design</u>

- *Avoidance of lattice towers with visually intrusive footing designs, save for situations where strain towers are required, stability/geotechnical aspects play a role*
- *Where the route crosses over several ridges, running parallel to the proposed route, the alignment should be located in the lower section so that the ridge lines forms a visual screen from both sides.*
- *The refined alignment should follow existing infrastructure corridors where the visual environment has already been compromised, and avoid visually sensitive areas and receptors where practical.*
- *Further GIS viewshed analyses should be done during the detail design stage to achieve the above strategies*

<u>Construction</u>

The placement and design of access roads, construction camps, security lighting, soil stockpiles and laydowns areas in a visually sensitive manner are important, as well as minimising vegetation clearance for construction.

With regards the possibility of burying powerlines along the P-234, although will reduce the visual impact, at the Integration meeting with the other specialists it was agreed that the overall impacts of burying the powerline are greater than the overall impacts of above-ground powerline. The impact ratings have therefore been done for above-ground powerlines.

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ACRONYMS

EIA	Environmental Impact Assessment
GIS	Geographic Information System
GPS	Geographical positioning System
VIA	Visual impact assessment
3D	Three-dimensional
VAC	Visual absorption capacity

ABBREVIATIONS

km	Kilometres
kV	kilo Volts
Mamsl	Meters above mean sea level

GLOSSARY OF TERMS

Study area	The area that has been covered by the EIA process within which possible study corridors have been investigated.
No-go area	An area in which the substation or powerline cannot be constructed due to resulting significant environmental, technical and social impacts.
Corridor	A corridor, approximately 2 km wide that is feasible for the routing of the proposed Transmission powerline which will be authorised by DEA. Within this approved corridor a final servitude will be negotiated by Eskom with individual landowners.
Alternatives	A possible course of action, in place of another, that would meet the same purpose and need defined by the development proposal. Alternatives considered in the ESIA process can include location and/or routing alternatives, layout alternatives, process and/or design alternatives, scheduling alternatives and input alternatives.
Environmental Impact Assessment	A public process that is used to identify, predict or cause the least damage to the environment at a cost acceptable to society, in the long term as well as in the short term.
Intensity	The magnitude of the impact on views, scenic or cultural resources.
Impact (Visual)	A description of the effect of an aspect of the development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.
Issue (visual)	Issues are concerns related to the proposed development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.
Level 4 assessment	Identification of issues raised during the scoping phase, site visit; description of the receiving environment and the proposed project; establishment of view catchment area, view corridors, viewpoints and receptors; indication of potential

	visual impacts using established criteria; description of alternatives, mitigation measures and monitoring programmes.
Receptors	Individuals, groups or communities who are subject to the visual influence of a project.
Sense of place	The unique quality or character of a place, whether natural, rural or urban
Significance	The significance of impacts can be determined through a synthesis of the aspects produced in terms of their nature, duration, intensity, extent and probability.
Viewpoint	A selected point in the landscape from which views of a project or another feature can be obtained.
Viewshed	The outer boundary defining a view catchment area, usually along crests and ridgelines
Visibility	The geographic area from which the project will be visible.
Visual absorption capacity (VAC)	The ability of an area to visually absorb development because of screening topography, vegetation or structures in the landscape.
Visual exposure	The relative visibility of a project or feature in the landscape. See also zone of visual influence.
Visual Impact Assessment	A Visual Impact Assessment simulates and predicts the significance and magnitude of the visual effects on the landscape.
Visual Intrusion	The level of compatibility or congruence of the project with the qualities of the area, or its sense of place. This is related to context and maintaining the integrity of the landscape or townscape.

1. STUDY INTRODUCTION

1.1 Background to Project

ESKOM Holdings SOC Ltd (Eskom) has commissioned a project to strengthen the supply of electricity in northern KwaZulu-Natal (KZN). The northern KZN network is currently fed at 132 kV by Normandie Substation and Impala Substation. The major load centres are Pongola and Makhatini Flats. Normandie Substation is situated approximately 80 km north-west of Pongola and Impala Substation is situated approximately 180 km south of Makhatini Flats. High voltage drops are experienced in the 132 kV network and the voltages are approaching unacceptable levels as the demand increases. Contingencies on the main 132 kV supplies also lead to thermal overloading of the remaining network.

In order to alleviate current and future network constraints in northern KZN, it is proposed that the Iphiva 400/132 kV Substation be introduced in the area, which will de-load the main sub-transmission network and improve the voltage regulation in the area.

The proposed project triggers several activities listed in the National Environmental Management Act (Act 36 of 1998) (NEMA) as requiring environmental authorisation before they can commence. The purpose of this study is to undertake an Environmental Impact Assessment (EIA) process, with associated Public Participation Process (PPP) and specialist studies, to enable the competent authority to decide whether the project should go ahead or not, and if so, then on what conditions. Four applications has been submitted, one each for the following:

1. The Iphiva Substation;
2. The 400 kV powerline from the Iphiva Substation to the Normandie Substation;
3. The 400 kV powerline from the Iphiva Substation to the Duma Substation, and
4. 65 km of 132 kV Distribution powerlines.

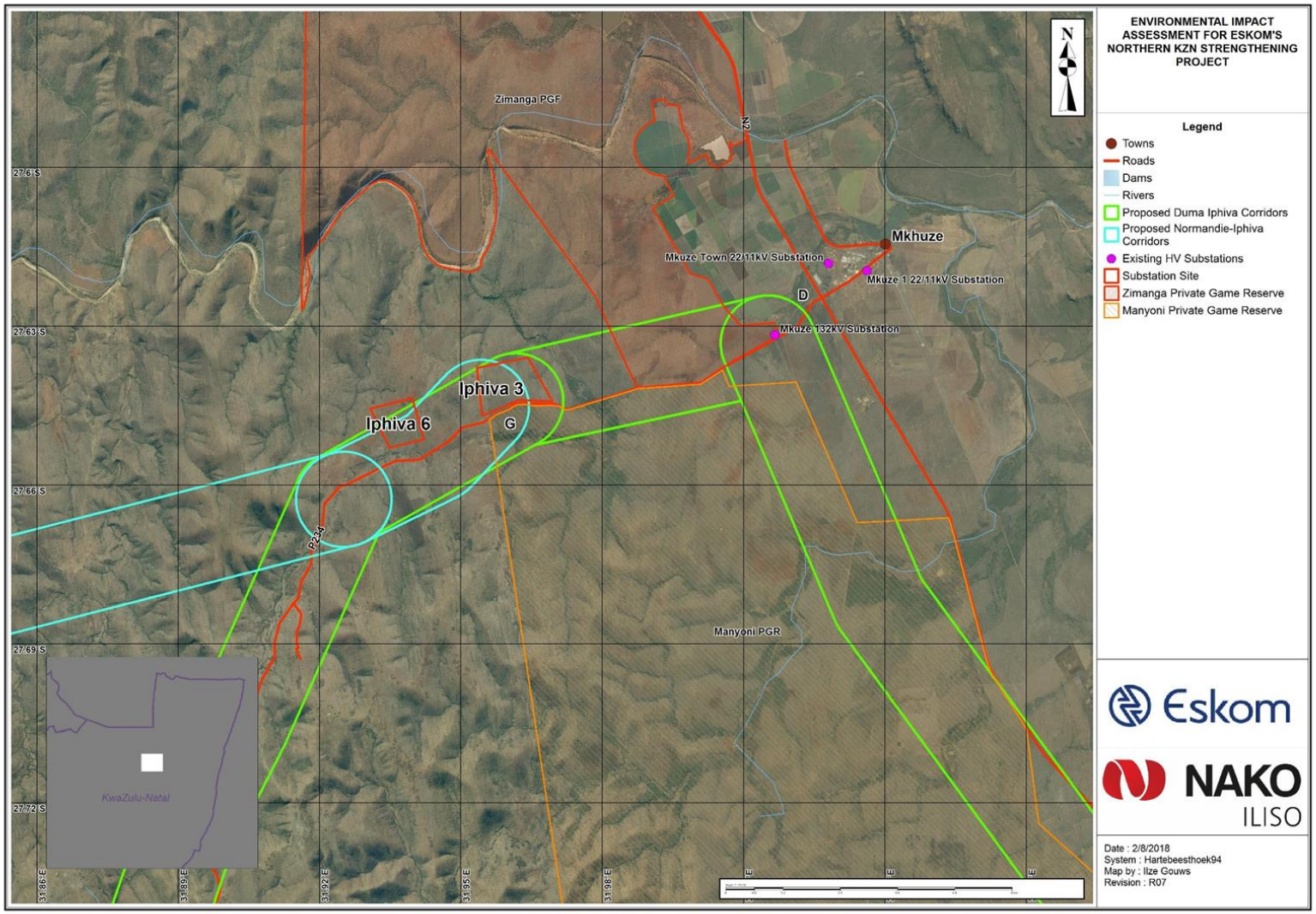

Figure 1-1: Iphiva Substation Alternatives

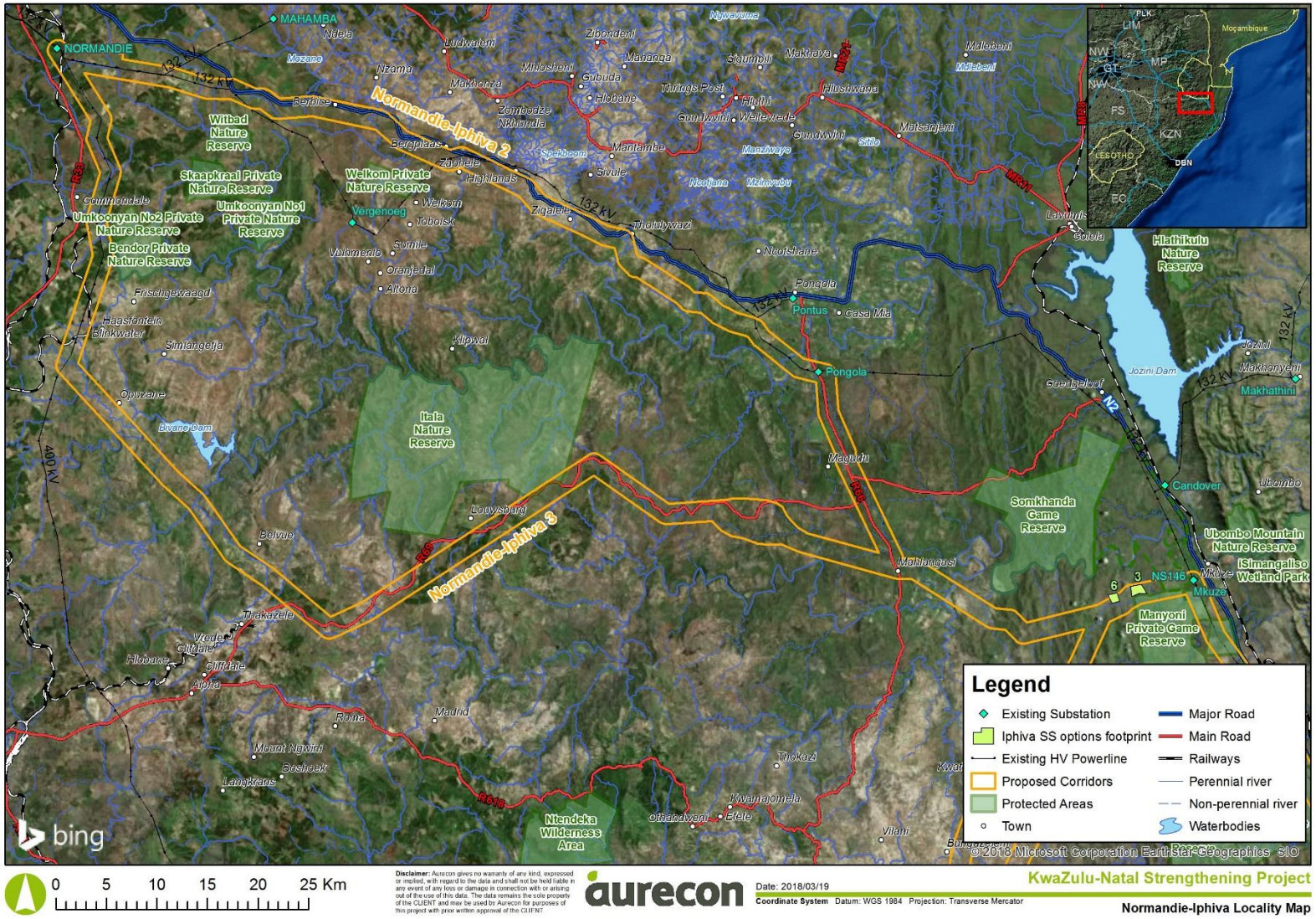

Figure 1-2: Normandie-Iphiva 400kV Powerline Alternatives

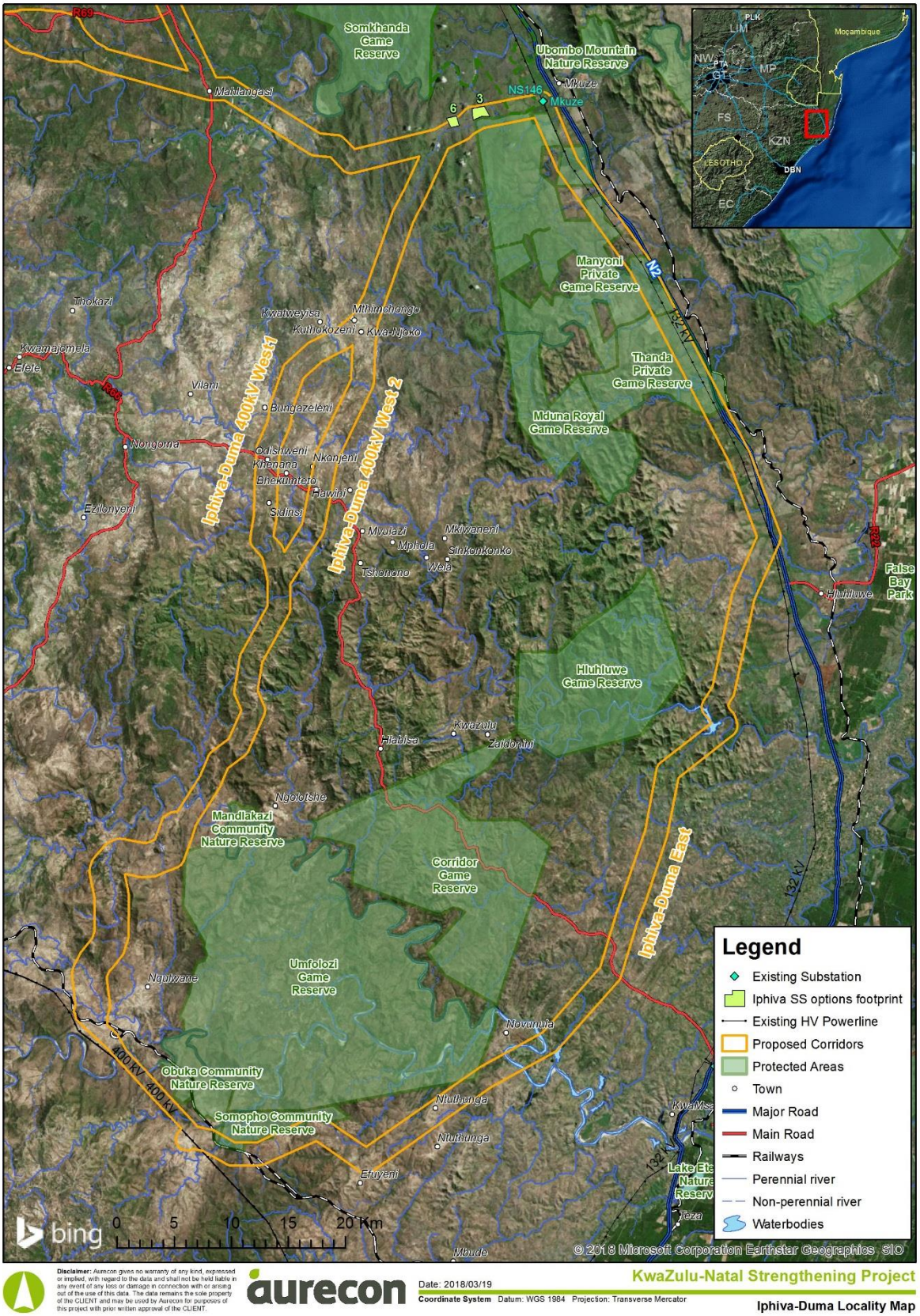

Figure 1-3: Iphiva-Duma 400kV Powerline Alternatives

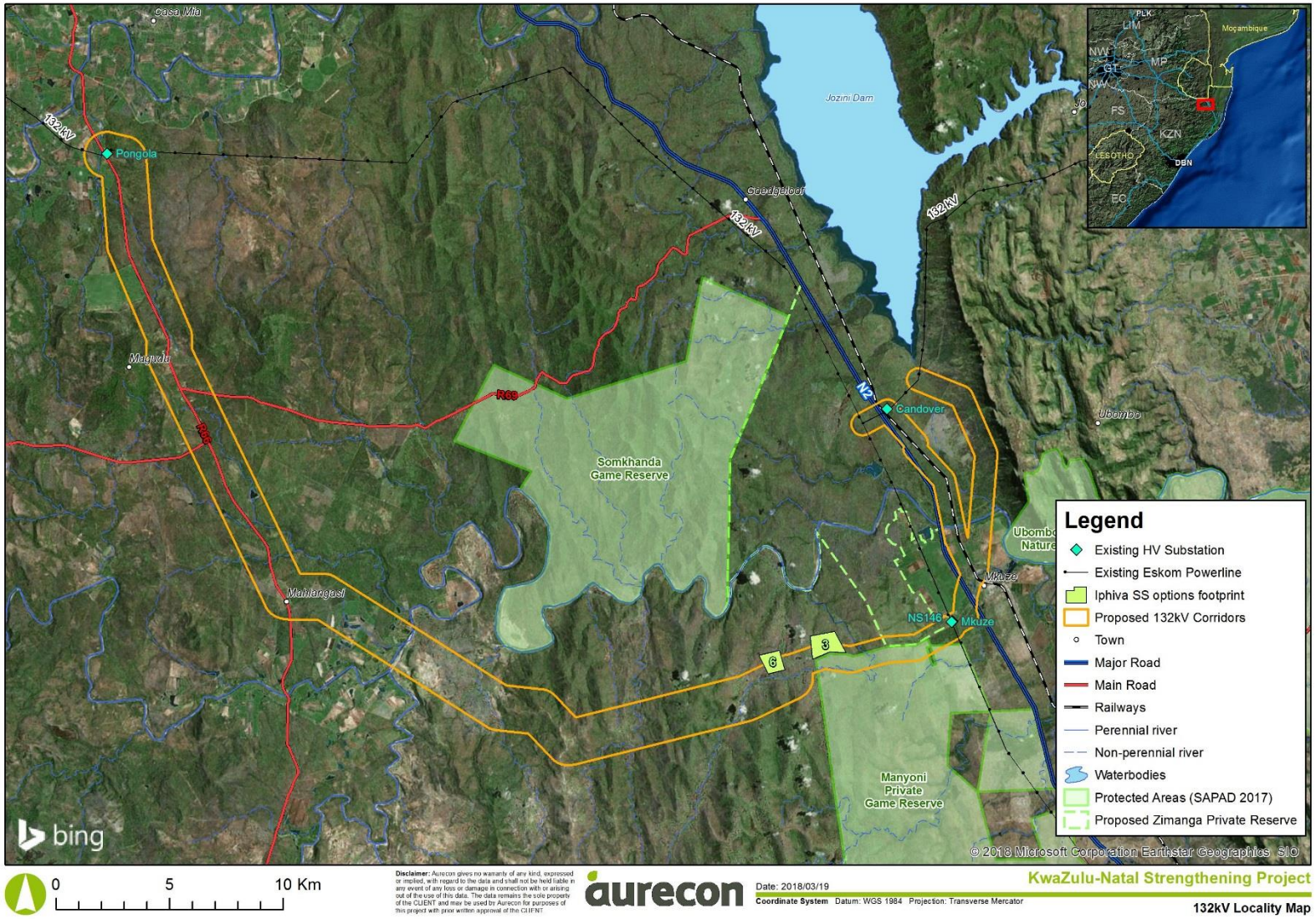

Figure 1-4: Location of 132kV Distribution Powerline Corridors

NAKO ILISO has appointed Aurecon to undertake the Visual Impact Assessment as part of the EIA.

1.2 Structure of this Report

This specialist study will be undertaken in compliance with Appendix 6 of GN 982 of 4 December 2014, as amended by Appendix 6 of GN 326 of 7 April 2017. **Table 1.1** indicates how Appendix 6 has been fulfilled in this report.

Table 1-1: Indication of compliance with Appendix 6 of GN 326 of 7 April 2017 in this report

Regulatory Requirements	Section of Report
(a) The person who prepared the report; and the expertise of that person to carry out the specialist study or specialised process.	Chapter 2
(b) a declaration that the person is independent	Page i
(c) an indication of the scope of, and the purpose for which, the report was prepared	Chapter 3
(cA) an indication of the quality and age of base data used for the specialist report	Chapter 4
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Chapter 6
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Chapter 3
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Chapter 4
(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	Chapter 7
(g) an identification of any areas to be avoided, including buffers	Chapter 7
(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	Chapter 7
(i) a description of any assumptions made and any uncertainties or gaps in knowledge	Chapter 5
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities	Chapter 7
(k) any mitigation measures for inclusion in the EMPr	Chapter 8
(l) any conditions for inclusion in the environmental authorisation	Chapter 8
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation	Chapter 8
(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	Chapter 12

Regulatory Requirements	Section of Report
(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	
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report	Chapter 9
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto	Chapter 10
(q) any other information requested by the competent authority	Chapter 11

2. PROJECT TEAM

The VIA report was undertaken by Elmie Weideman and Johan Goosen of Aurecon. Both Mr Goosen and Mrs Weideman are qualified as Landscape Architects and registered with the South African Council for the Landscape Architectural Profession (SACLAP).

All GIS mapping was compiled by Stephen Townshend of Aurecon, who has extensive experience in GIS modelling and viewsheds, photomontages, and photographic experience for visual impact assessments.

Mr Goosen has undertaken numerous VIAs prior to joining Aurecon (refer to his CV). Mr Goosen and Mrs Weideman have completed the following VIAs over the past five years (in Aurecon):

- A 150-km transmission powerline for Eskom between Pietermaritzburg and Empangeni, Kwazulu Natal (400 kV);
- An ash dam facility for Eskom at Kriel power station, Mpumalanga;
- A wind farm for Just Energy near St. Helena Bay;
- A crude oil storage farm near Saldanha Bay;
- Upington Solar Farm, near Upington in the Northern Cape province;
- Various reservoirs located within the Olifants River catchment located in the Northern Province and Mpumalanga;
- A 200 MW photovoltaic facility close to Westonaria; and
- A 210-km transmission powerline for Southern African Power Pool (SAPP) on behalf of Eskom of South Africa and Botswana Power Corporation of Botswana (400 kV).

Further details of VIA experience can be found in the respective CVs of the three team members (See Appendix A).

3. PURPOSE OF REPORT AND SCOPE OF WORK

> Environmental Impact Assessment Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended by Appendix 6 of GN 326 of 7 April 2017:
>
> 1. (1) A specialist report prepared in terms of these Regulations must contain—
>
> (c) an indication of the scope of, and the purpose for which, the report was prepared;

The scope of the study is to define the spatial context of influence of the proposed development/s in terms of the visibility of the overhead transmission and distribution powerlines, the sub stations and to identify potential sensitive receptor locations.

In terms of the *Guideline for Involving Visual and Aesthetic Specialist on EIA Processes* (Oberholzer, 2005), the depth and scope of a VIA should be based on a combination of the sensitivity of the existing environment and the nature of the development. The type of environment and type of development are both divided into five categories, which are indicated in a matrix (Refer to Figure 3-1). The category of development is based on Figure 3-2, extracted from the same document.

The proposed development has been categorised as a Category 4 development (medium scale infrastructure) according to Figure 3-2 and the environment has been categorised as "an area with high scenic, cultural and historic significance" according to Figure 3-1. In terms of the matrix, the development can be expected to result in a development of moderate to high visual impact, which will require a Level 4 visual assessment (refer Figure 3-3). Typically a Level 4 visual assessment includes the following:

- Identification of issues raised in the scoping phase, and a site visit;
- Description of the receiving environment and the proposed project;
- Establishment of view catchment area, and receptors;
- Indication of potential visual impacts using established criteria;
- Inclusion of potential lighting impacts at night;
- Description of alternatives, mitigation measures and monitoring programmes; and

Table 1: Categorisation of issues to be addressed by the visual assessment

Type of environment	Type of development (see Box 3) Low to high intensity				
	Category 1 development	Category 2 development	Category 3 development	Category 4 development	Category 5 development
Protected/wild areas of international, national, or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural, historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural, historical significance / disturbed	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites / run-down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

Figure 3-1: Categorisation of issues to be addressed by the visual assessment

Box 3: Key to Categories of Development

Category 1 development:
e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.

Category 2 development:
e.g. low-key recreation / resort / residential type development, small-scale agriculture / nurseries, narrow roads and small-scale infrastructure.

Category 3 development:
e.g. low density resort / residential type development, golf or polo estates, low to medium-scale infrastructure.

Category 4 development:
e.g. medium density residential development, sports facilities, small-scale commercial facilities / office parks, one-stop petrol stations, light industry, medium-scale infrastructure.

Category 5 development:
e.g. high density township / residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.

Figure 3-2: Key categories of development

Table 2: Categorisation of approaches used for visual assessment

Approach	Type of issue (see Box 4)				
	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	Very high visual impact expected
Level of visual input recommended	**Level 1** visual input	**Level 2** visual input	**Level 3** visual assessment	**Level 4** visual assessment	

Figure 3-3: Categorisation of approaches

Box 4: Key to Categories of Issues

Very high visual impact expected:
Potentially significant effect on wilderness quality or scenic resources;
Fundamental change in the visual character of the area;
Establishes a major precedent for development in the area.

High visual impact expected:
Potential intrusion on protected landscapes or scenic resources;
Noticeable change in visual character of the area;
Establishes a new precedent for development in the area.

Moderate visual impact expected:
Potentially some affect on protected landscapes or scenic resources;
Some change in the visual character of the area;
Introduces new development or adds to existing development in the area.

Minimal visual impact expected:
Potentially low level of intrusion on landscapes or scenic resources;
Limited change in the visual character of the area;
Low-key development, similar in nature to existing development.

Little or no visual impact expected:
Potentially little influence on scenic resources or visual character of the area;
Generally compatible with existing development in the area;
Possible scope for enhancement of the area.

Figure 3-4: Key categorisation of issues

4. METHODOLOGY

4.1 Approach

Figure 4-1 provides a schematic summary of Aurecon's approach to visual assessment.

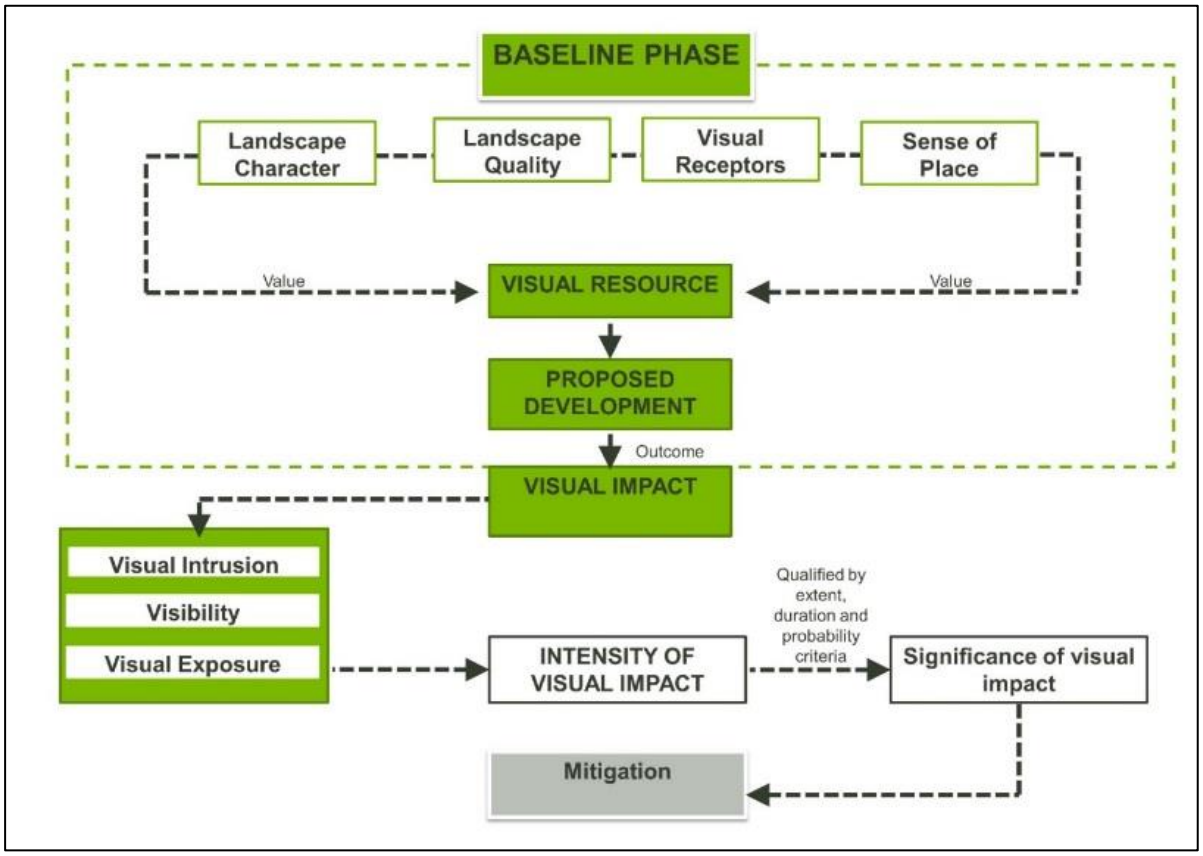

Figure 4-1 Aurecon's VIA Study Approach

4.2 Legislation

There are no specific legal requirements, nor is there any direct reference to the visual environment in the applicable environmental legislation. General legislation relating to the environment is contained in the following acts:

- National Environmental Management Act, 1998 (NEMA) (Act No. 107. Of 1998)
- Environment Conservation Act, 1989 (Act No.73 of 1989)
- National Environmental Management Protected Areas Act, 2003 (NEM: PAA) (Act No. 57 of 2003)
- National Heritage Resources Act, 1999 (Act No.25 of 1999)
- Visual pollution is controlled, to a limited extent, by the Advertising on Roads and Ribbon Development Act, 1940 (Act No.21 of 1940), which deals mainly with signage on public roads.
- The National Environmental Management: Protected Areas Act (Act

The Western Cape DEA&DP has produced a guideline (Oberholzer, 2005) for involving visual and aesthetic specialists in Environmental Impact Assessment (EIA) processes. Aurecon's methodology is based on this guideline.

4.3 Visual assessment methodology

The following method was used:

- A site visit was undertaken from 30th October – 3 November 2017. An appraisal of the land use, land cover, visual adsorption capacity, and "sense of place" was undertaken to confirm the desktop GIS analyses completed before the site visit. As is the industry practice for such a large study area, this assessments was done mostly from publicly accessible roads in the area. Positions where representative photos were taken from, were logged with GPS, and shown in Figure 6-1.
- The landscape was mapped for ruggedness, land use, land cover (including vegetation type), topography, using GIS technology;
- The physical and technical characteristics of the project components was described and illustrated;
- The visual resource (landscape character, landscape quality, sense of place and visual receptors) was described; and
- The information was depicted by maps. Critical areas was highlighted during this phase, which was studied in more detail during the impact assessment phase.

4.3.1 Baseline phase

The baseline phase will describe the visual resource and the technical information associated with the proposed development. The description of the visual resource includes:

- The baseline conditions in terms of the **landscape character;**
- The **landscape quality** in terms of the visual absorption capacity and overall aesthetic appeal which included the existing land cover, intrinsic physical properties, landform, vegetation, water, colour, adjacent scenery, scarcity and cultural modifications; and
- The **sense of place**/*genius loci*

The technical information focuses on the main project components.

(a) Landscape character

Landscape character includes the natural and man-made attributes of the study area, including topography, land cover and vegetation. The overall landscape character is influenced negatively by incompatible activities, or positively by the presence of natural or man-made features that enrich the character, such as steep gradients, presence of rocky ridges, koppies, natural vegetation, wetlands and floodplains.

(b) Sense of Place

The sense of place in the study area derives from the combination of all landscape types and their impact on the senses and is influenced negatively or positively by natural or man-made features or activities that interrupt the vast open space. Sense of place is informed by the aspects of scale, texture, landform, enclosure and land use.

(c) Landscape Quality

Landscape quality is based on human perceptions and expectations in the context of the existing environment. The landscape quality is based on a combination of the landscape's intrinsic physical properties, consisting out of the landform, vegetation, water, colour, adjacent scenery, scarcity, cultural or man-made modifications and the visual absorption capacity (VAC).

Landscape quality increases with the presence of water, topographic ruggedness and where diverse patterns of vegetation occur. Areas that contain more natural features or harmonious man-made compositions will have a more favourable landscape quality than areas with non-harmonious human activity. Landscape quality is rated from high – low as indicated in Table 4-1.

Table 4-1 Landscape quality rating

Landscape quality rating	Criteria	Rating
High	Unmodified landscape: The landscape is almost free from human encroachment. Visual integrity occurs and where human intervention is visible, no visual discontinuity occurs and visual order is harmoniously maintained. Strongly defined landforms are noted, including mountains and large bodies of water. Distinct visual patterns are formed through patterns, colours and textures.	3
Moderate	Moderately transformed/disturbed landscape: There is average visual integrity between the natural and manmade landscape. Some visual encroachment is visible which lacks visual order. There is some disruption of the natural and man-made patterns. Moderately distinctive landscape patterns are visible, including rolling hills and smaller water bodies.	2
Low	Extensively transformed human intervention: There is low or no visual integrity between the natural and man – made natural features. The visual integrity of the landscape is disrupted and visual order is entirely lost. Little visual patterns are formed and vegetation patterns, colours and textures are not noticeable.	1

Landscape qualities were assigned to the landscape types as discussed under sections:

Table 4-2: Landscape quality (site specific)

High	Moderate	Low
All formal and privately protected areas. Unique scenic natural features such as waterbodies, ridges, rivers, and wetlands.	Farmsteads, forestry areas, agricultural activities, grazing fields. All natural vegetated areas which are not formally protected, but with some form of development or infrastructure present.	Dispersed rural settlements, formal towns, and industrial sites / mines, and existing infrastructure corridors (such as along the N2).

(d) Visual Absorption Capacity

VAC is an indication of the ability of the landscape to visually conceal the development. Areas with high VAC can accommodate and absorb physical changes in the landscape without transforming its visual character and quality. The factors that contribute to the VAC factor includes slope, vegetation height and visual pattern.

VAC in terms of topography, can be expressed as follows:

- High VAC – Slope >7 %;
- Moderate VAC – Slope between 3 -7 %; and
- Low – 0 -3 %.

VAC in terms of visual pattern/diversity can be expressed as follows:

- High VAC – A diverse visual pattern, such as built-up areas and industrialized/mining zones, where tall structures provide a high degree of screening;
- Moderate VAC – A moderate diverse visual pattern, such as rural and medium to low density urban and rural areas; and
- Low – A uniform visual pattern, such as naturally landscaped areas with no man-made structures.

VAC in terms of vegetation height

- High VAC – Vegetation height more than 5 m;
- Moderate VAC – Vegetation height between 1-5 m; and
- Low – Vegetation height less than 1 m.

Table 4-3: Visual Absorption Capacity Rating

Visual Absorption Capacity rating	Rating
High	1
Moderate	2
Low	3

(e) Viewer / receptor sensitivity

Receptors for visual impacts are potential viewers of the proposed development. Receptor sensitivity refers to the degree that a development affects people. Receptor sensitivity depends on the number of people viewing the project and their perceptions of the study area. Perception of an object is linked to the purpose for which a viewer is present in the study area (i.e. the reason for their visit).
The sensitivity of an individual to the visual impact of a proposed development may, therefore, also vary over time as they experience different features and land uses in the area. Receptor sensitivity is also influenced by how likely the receptors are to be affected. It is furhter dependent on their perception of the area and their ability to adapt to changes in their environment and can include how frequently they are exposed to the view.

A visual receptor's sensitivity is based upon the viewer's:

- Familiarity with the actual scene;
- Circumstances that brings them into contact with that view; and
- Nature of the view (full or glimpsed, near or distant).

Receptor sensitivity is expressed as follows:

- High sensitivity – e.g. views to and from nature reserves, coastal areas and scenic routes or trails;
- Moderate sensitivity – e.g. views to and from residential areas, agricultural areas, sporting / recreational areas or places of work; and
- Low sensitivity – e.g. views to and from industrial, mining or degraded areas.

The criteria used to define receptor sensitivity are summarised in Table 4-4. Project-specific receptor sensitivity will be presented in Chapter 6.

Table 4-4: Receptor sensitivity

Receptor perception rating	Criteria
High	People attach a high value to aesthetics, such as in or around a game reserve, coastal areas, scenic routes or conservation areas, and the project is perceived to significantly impact on this value of the landscape
Moderate	People attach a moderate value to aesthetics, such as rural homesteads, neighbourhoods and smaller towns with high scenic value and sense of place, 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. Environment has already been transformed. Towns with low scenic value and poor sense of place.

4.3.2 Assessment phase

The assessment phase consists of the following tasks:

- Analysis of the proposed development in terms of the criteria such as **visibility, visual intrusion**, **visual exposure** (of the development) to determine the **intensity** of the impact. A 3D GIS terrain model was used to assess the visibility of the infrastructure as a whole, or parts thereof, from significant viewpoints within the viewshed.
- Emphasis was placed on potential visual receptors and critical views towards the proposed development. Photographs and a GPS was used to record relevant geographical locations within the vicinity of the corridor. Unique viewpoints were selected according to land uses and different landscape characteristics
- Determine the impact **significance** by synthesising the assessment criteria as described above.
- Recommend **mitigation measures** to reduce the potential negative impacts; and

(a) Visibility

The visibility or viewshed (zone of theoretical visibility) of the project is the area from which the project will be visible. The viewshed is theoretical as it assumes direct line of sight between any point within the viewshed and the object being viewed. However, the actual visibility will be smaller because of screening by trees, local variations in topography, buildings and other infrastructure.

A GIS has been used to generate the viewshed analyses for the proposed powerlines and related infrastructure. The system has three-dimensional topographical modelling capabilities, including a line of sight analysis. For this project, the viewshed analysis was generated by means of contours and using the conceptual alignment and height of the proposed powerlines. The visibility of a development and its influence on visual impact is rated using the criteria listed in Table 4-5 below:

Table 4-5: Visibility

Visibility (Based on the viewshed analysis)	Criteria	Rating
High	The development is visible from more than 50% of the zone of potential influence, views are unobstructed and the majority of viewers are affected.	3
Moderate	The development is visible from less than 50% of the zone of potential influence.	2
Low	The development is visible from less than 25% of the zone of potential influence.	1

(b) Visual intrusion

The degree of visual intrusion is related to the idea of context and maintaining the integrity of the landscape and essentially rates the degree of contrast between the appearance of the proposed development and the existing environment. The higher the landscape quality and the more consistent the visual context, the more likely the impact will be intrusive. Visual intrusion is rated according to Table 4-6.

Table 4-6: Visual intrusion

Visual intrusion (How the project fits into the surrounding landscape)	Criteria	Rating
High	Results in a noticeable change or is discordant with the landscape	3
Moderate	Partially fits into the landscape, but clearly noticeable	2
Low	Minimal change or blends in well with the landscape	1

(c) Visual exposure

According to Hull and Bishop (1998), the visual exposure of the proposed project is based on the distance from the proposed source of impact. The visibility of an object decreases exponentially over distance and accordingly visual impact will diminish as the viewer moves away from the object being viewed. The influence of distance is shown in Figure 4-2 and the criteria for visual exposure rating are explained in Table 4-7.

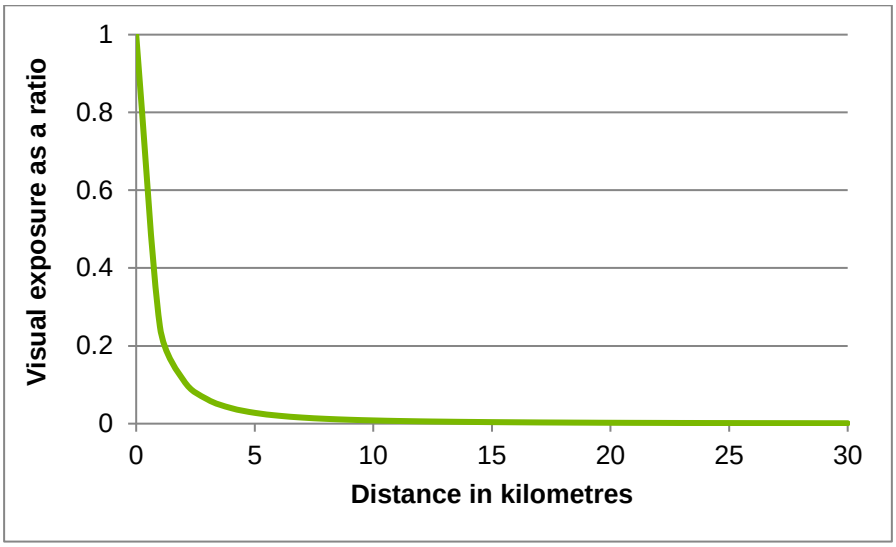

Figure 4-2: Visual exposure (after Bishop & Hull 1998)

Table 4-7: Visual exposure rating

Visual exposure (How far is the activity from the viewers)	Criteria	Rating
High	0 -1 km (Dominant or clearly visible)	3
Moderate	1 – 3 km (Recognizable to the viewer)	2
Low	>3 km (Not particularly noticeable to the viewer)	1

4.3.3 Assessment of route alternatives

The following criteria was used to analyse alternatives and identify the preferred route (from visual impact perspective):

- Visual resource sensitivity (based on topography, vegetation, land use);
- Sensitivity of visual receptors (are they residing in the area or just passing by?);
- Visibility of the project (lower lying areas, compared to higher lying areas);
- Length of the transmission / distribution powerline corridors;
- Does the corridor cross (or come into close proximity) to large game reserves and areas of high tourism value;

4.3.4 Visual impact assessment resources

The software tools and techniques that were used during the VIA include the following:

- GIS applications using ArcView:
    - Data capturing and processing;

- Digital terrain modelling;
- Mapping;

- Site visit; and
- Photographs.

4.3.5 Study area

The overall study area for this VIA is based on the spatial extent of the infrastructure footprint and a buffer that includes potential indirect effects on the environment. For the purposes of the VIA, the boundary of the study area is set at 7 km on both sides of the proposed alignment.

The distance of 7 km was selected based on human vision being restricted to this range. Structures further away than 7 km are no longer clearly discernible or are most inconspicuous and therefore the visual impact beyond this range is considered negligible.

4.4 Impact assessment methodology

> Environmental Impact Assessment Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended by Appendix 6 of GN 326 of 7 April 2017:
>
> 1. (1) A specialist report prepared in terms of these Regulations must contain—
> (c) an indication of the quality and age of base data used for the specialist report;
> (d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;
> (e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;

The key issues identified during the Scoping Phase informed the terms of reference of the specialist studies. Each issue consists of components that on their own or in combination with each other give rise to potential impacts, either positive or negative, from the project onto the environment or from the environment onto the project. In the EIA the significance of the potential impacts will be considered before and after identified mitigation is implemented, for direct, indirect, and cumulative impacts, in the short and long term.

A description of the nature of the impact, any specific legal requirements and the stage (construction / decommissioning or operation) will be given. Impacts are considered to be the same during construction and decommissioning.

The following criteria will be used to evaluate significance:

4.4.1 Nature

This is an appraisal of the type of effect the activity is likely to have on the affected environment. The description includes what is being affected and how. The nature of the impact will be classified as positive or negative, and direct or indirect.

4.4.2 Extent

This indicates the spatial area that may be affected (Table 4-8).

Table 4-8: Geographical extent of impact

Rating	Extent	Description
1	Footprint	Impacted area is only the actual extent of the activity. (i.e. the 400 m x 400 m footprint of the substation or 55 m wide servitude of the powerline)
2	Site	Impacted area is limited to the site and its immediate surrounding area. (i.e. the 2 km corridor for transmission powerlines, and 1 km x 1 km site for the substation).
3	Local	Up to a maximum distance of 7 km from a component of project infrastructure (such as a particular pylon or substation)
4	Regional	Impacted area extends beyond the district municipal borders. (*Not applicable to this visual specialist study*)
5	Beyond Regional	Impact considered of provincial or national importance. (*Not applicable to this VIA specialist study*)

4.4.3 Duration

This measures the lifetime of the impact (Table 4-9).

Table 4-9: Duration of Impact

Rating	Duration	Description
1	Short term	0 – 3 years, or length of construction period
2	Medium term	3 – 10 years
3	Long term	> 10 years, or entire operational life of project.
4	Permanent – mitigated	Mitigation measures of natural process will reduce impact – impact will remain after operational life (decommissioning / dismantling of infrastructure) of project.
5	Permanent – no mitigation	No mitigation measures of natural process will reduce impact after implementation – impact will remain after operational life (decommissioning / dismantling of infrastructure) of project.

4.4.4 Intensity / severity

This is the degree to which the project affects or changes the environment; it includes a measure of the reversibility of impacts (Table 4-10).

Table 4-10: Intensity of Impact

Rating	Intensity	Description
1	Negligible	Structure barely visible (because of distance or screening) over short and medium term.
2	Low	Structure slightly visible (because of distance or screening) over the short and medium term. Cultural and social functions and processes can be reversed to their original state.
3	Medium	Structure in direct line of sight of between 1 - 3 km, and not dominating the general view, over the medium and long term. Environment remarkably altered, still functions, if in modified way. Negative impacts cannot be fully reversed. (*Receptors partially dependent upon a pristine visual resource (such as a guest houses, game lodges in protected areas) experience a noticeable (>10%) decline in their livelihoods / property values as result of the visual impact of the project.*)
4	High	Structure (such as a number of transmission powerline pylons or substation) highly visible, i.e. in direct line of sight within less than 1 km, dominating the general view ("in your face") over the medium and long term. Cultural and social functions and processes disturbed – potentially ceasing to function temporarily. Negative impacts cannot be reversed. (*Receptors partially dependent upon the pristine visual resource (such as a guest houses, game lodges in protected areas) experience a significant decline (>30%) in their livelihoods / property values as result of the visual impact of the project.)*
5	Very high	Large (single-element solid façade) structure with (such as a factory or power station) highly visible, i.e. in direct line of sight within less than 1 km, dominating the general view ("in your face") over the medium and long term. Cultural and social functions and processes permanently cease, and valued, important, sensitive or vulnerable communities are substantially affected. Negative impacts cannot be reversed. (*Receptors partially dependent upon the pristine visual resource (such as a guest houses, game lodges in protected areas) experience a fatal decline (>60%) in their livelihoods / property values as result of the visual impact of the project.)*

4.4.5 Potential for irreplaceable loss of resources

This is the degree to which the project will cause loss of resources that are irreplaceable (Table 4-11).

Table 4-11: Potential for irreplaceable loss of resources

Rating	Potential for irreplaceable loss of resources	Description
1	Low	No irreplaceable resources will be impacted.
3	Medium	Resources can be replaced, with effort.
5	High	There is no potential for replacing a particular vulnerable resource that will be impacted.

4.4.6 Probability

This is the likelihood or the chances that the impact will occur (Table 4-12).

Table 4-12: Probability of Impact

Rating	Probability	Description
1	Improbable	Under normal conditions, no impacts expected.
2	Low	The probability of the impact to occur is low due to its design or historic experience.
3	Medium	There is a distinct probability of the impact occurring.
4	High	It is most likely that the impact will occur
5	Definite	The impact will occur regardless of any prevention measures.

4.4.7 Confidence

This is the level of knowledge or information available, the environmental impact practitioner or a specialist had in his/her judgement (Table 4-13).

Table 4-13: Confidence in level of knowledge or information

Rating	Confidence	Description
1	Low	Judgement based on intuition, not knowledge/ information.
2	Medium	Common sense and general knowledge informs decision.
3	High	Scientific / proven information informs decision.

4.4.8 Consequence

This is calculated as extent + duration + intensity + potential impact on irreplaceable resources.

4.4.9 Significance

The significance will be rated by combining the consequence of the impact and the probability of occurrence (i.e. consequence x probability = significance). The maximum value which can be obtained is 100 significance points (Table 4-14).

Table 4-14: Significance of issues (based on parameters)

Rating	Significance	Description
1-14	Very low	No action required.
15-29	Low	Impacts are within the acceptable range.
30-44	Medium-low	Impacts are within the acceptable range but should be mitigated to lower significance levels wherever possible.
45-59	Medium-high	Impacts are important and require attention; mitigation is required to reduce the negative impacts to acceptable levels.
60-80	High	Impacts are of great importance, mitigation is crucial.
81-100	Very high	Impacts are unacceptable.

4.4.10 Cumulative Impacts

This refers to the combined, incremental effects of the impact, taking other past, present and future developments in the same area into account. The possible cumulative impacts will also be considered.

4.4.11 Mitigation

Mitigation for significant issues will be incorporated into the EMPR.

5. ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

> Environmental Impact Assessment Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended by Appendix 6 of GN 326 of 7 April 2017:
>
> 1. (1) A specialist report prepared in terms of these Regulations must contain—
> (i) a description of any assumptions made and any uncertainties or gaps in knowledge

The following limitations and assumptions are applicable to this report:

- Determining a visual resource in absolute terms is not achievable. It is a complex procedure since it is determined through a combination of quantitative (visibility) and qualitative (aesthetic value) criteria. Therefore, a VIA cannot be entirely objective in this sense. Individuals will evaluate a landscape differently, based on experience, culture and social background.
- Various factors can enhance or reduce the visual impact of the proposed project, for instance, vegetation near a receptor's view of the proposed project. Other factors include weather, climatic conditions and seasonal change. It is therefore difficult to determine the visual impact of the proposed project from the viewpoint of each individual receptor.
- The layouts and technical designs provided are conceptual. Therefore, the possibility of adaption exists. Should there be any significant changes in the designs of the proposed infrastructure, these changes may have to be re-assessed.
- The exact position for construction camps and laydown areas are not available at this stage therefore related detailed viewpoints towards the proposed impact cannot be determined.
- Final design decisions on pylon structures has not yet been made, as the detail engineering stage of the project is not yet underway. The accuracy of visual impact of the powerlines is therefore limited in this regard.
- As the exact location of the powerlines within each corridor have not yet been fixed, where the proposed powerline crosses a series of ridges, they should be positioned in such a manner that it runs parallel with the lowest lying area therefore higher lying ridges on both sides will form a natural visual buffer.
- Tourism livelihood are in some instances attached to large undeveloped tracts of land with high visual resource value, such as nature reserves. An assessment of tourism value has been undertaken as part of **Appendix K: Economics Specialist Study**, and therefore not addressed here.
- Access to certain viewpoints on IAPs' properties could not be gained (due to unavailability of these persons). Photos could therefore not be taken, despite the project team's requests to the land-owner to gain such access.

- Visual assessment from the locations of tourism points of interest such as lodges can only be made from existing facilities, with proven dependence on the natural landscape as visual resource. Proposed locations of lodge sites was not assessed.
- Visual simulations was not undertaken in this study.

6. EXISTING ENVIRONMENT

Environmental Impact Assessment Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended by Appendix 6 of GN 326 of 7 April 2017:

1. (1) A specialist report prepared in terms of these Regulations must contain—
(c) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;

This section of the report analyses the existing landscape character, landscape quality and sense of place. This analysis assists the reader by describing the visual resource before the development. This is essential as the existing environment must be understood before assessing the impacts that will potentially change the existing environment.

The character and sensitivity of the visual environment within the study area varies at a local scale, depending on the presence of water bodies, ridges, agricultural use, roads, industrial infrastructure and urban and/or rural settlements. The preferred alternative alignment traverses various landscape types and therefore the sensitivity to visual impacts for each of the landscape types will differ.

The photos in this section were selected from a greater suite of photos taken for the assessment. The selected photos best represent the landscape character of the various alternative alignments / sites for the project. See **Figure 6-1** for the location of these selected photo locations in relation to the greater study area.

6.1 Overview of the receiving visual environment

6.1.1 Topography

The dominant landscape features are valley slopes to undulating hills and flat plains with a network of trailing rivers and smaller streams. The northern and central parts of the proposed study area are more mountainous and has extreme topographical features. Two extreme areas where topographical features is observed is in the north along the Pongola River and east, close to the N2.

Mean elevation ranges from 0 m above mean sea level (mamsl) to 2,000 mamsl above sea level. The typical height increases as one moves further away from the coast. Eastern areas ranges from 0 – 910 mamsl, while areas in the west ranges from 655 – 1,559 mamsl.

6.1.2 Land use / cover

The majority of the study area's land use / cover consist of:

- *Commercial farming* - large sugarcane plantations occur around Pongola as well as an area on the R66 towards Nongoma, where the R66 crosses the Mkhuze River. Croplands coincide with the more evenly sloped areas.
- *Forestry* - Significant forestry areas occur in the following high-lying areas:
    - Areas north of Frischgewaagd; and
    - Along the R69 to Louwsburg.
- *Dispersed rural settlement* - informal housing settlements (villages) and single isolated homesteads are scattered throughout the study area, coinciding with subsistence agriculture.
- *Larger formalised towns* - these include Louwsburg, located more towards the west of the study area and Pongola, located towards the north of the study area.
- *Presence of existing / approved infrastructure* – Although not a land use per se, the presence of infrastructure such as roads, rail and existing transmission lines do affect the visual sensitivity of the landscape, especially along the N2.
- *Conservation / game farming* – there are large areas in the study area with formal status under NEM:PAA, and a range of private nature reserves. It follows that these areas have high tourism value within, and bordering the study area.

Refer to **Figure 6-2** for the land cover map of the entire study area with the corridors of the various project alternatives.

As indicated in the Final Scoping Reports for the project ((ILISO 2017), the study are is characterised by large number of protected and conservation areas (varying from provincially proclaimed reserves to private game farms), including the South African Protected Areas Database (2016):

- Bendor Private Nature Reserve;
- Corridor Game Reserve;
- Hluhluwe Game Reserve;
- iSimangaliso Wetland Park;
- Itala Nature Reserve;
- Mandlakazi Community Nature Reserve;
- Mduna Royal Game Reserve;
- Mkuzi Game Reserve;
- Ntendeka Wilderness Area;
- Obuka Community Nature Reserve;
- Skaapkraal Private Nature Reserve;
- Somkhanda Game Reserve;
- Somopho Community Nature Reserve;
- Thanda Private Game Reserve;
- Ubombo Mountain Nature Reserve;
- Umfolozi Game Reserve;

- Umkoonyan No1 Private Nature Reserve;
- Umkoonyan No2 Private Nature Reserve;
- Welkom Private Nature Reserve;
- Witbad Nature Reserve; and
- Manyoni Private Game Reserve (MPGR).

Private game reserves, such as the MPGR, which is owned by a consortium of owners, and Zimanga Private Game Park (owned by Charl Senekal) develop facilities in the reserve for their own and tourist use. These reserves rely on income from tourists that make use of the facilities to fund their operations.

6.1.3 Vegetation cover

The study area mostly falls within the Savanna biome, gradually moving into the grassland biome towards the west in the vicinity of the Normandie substation. According to Mucina and Rutherford this main biome type have an herbaceous layer usually dominated by grass species and a discontinuous, open tree layer. Tree canopies are often an irregular series of interlocking (often low) canopies with openings and sometimes little distinction between tall shrubs and small trees.

In lower lying areas, such as river gorges, *Acacia* and *Combretum* is the dominant tree species whereas higher lying areas are mostly covered by open, tall grasslands, often dotted with bushes and solitary Savanna trees. Extensive flat plains or areas of moderate undulating landscapes support various units ranging from sparsely scattered solitary trees and shrubs to a mosaic with typical savanna thornveld, bushveld and thicket patches.

- From the site visit it appears that only the formally protected areas and forestry areas still has significant tree cover;
- Dispersed rural settlement areas, formal towns and sugarcane areas will likely have little screening value in terms of visual impact.

6.1.4 Receptor sensitivity

Projects-specific receptor (viewer) sensitivity is discussed here. This understanding of viewer sensitivity is based on previous experience of the visual specialists, social specialist and the economic specialist.

Table 6-1: Receptor (viewer) sensitivity

Receptor perception rating	Criteria	Project-specific receptor
High	People attach a high value to aesthetics, such as in or around a game reserve, coastal areas, scenic routes or conservation areas, and the project is perceived to significantly impact on this value of the landscape.	• Guest houses, game lodges and nature-based tourism in protected areas dependent upon a pristine visual resource for tourism value.
Moderate	People attach a moderate value to aesthetics, such as such as rural homesteads, neighbourhoods and smaller towns with high scenic value and sense of place, where natural character is still plentiful and in close range of residency.	• Rural (commercial farming) homesteads
Low	People attach a low value to aesthetics, when compared to employment opportunities. Environment has already been transformed. Towns with low scenic value and poor sense of place.	• National / provincial road users (N2 / R33 / R69 / R66) where other infrastructure is present and transformation has already taken place • Formal settlements (such as Pongola / Mkuze / Ulundi) • Informal settlements / villages (likely considers transmission lines as a sign of progress)

6.1.5 Existing environment comparison tables

For each of the applications where alternatives need to be compared, rated and a preferred alignment or site chosen, the receiving visual environment has been compared in a table format for the sake of objectivity. The sensitivity of relevant viewer / receptor groups associated with the various alignments were also rated.

These tables, descriptions and ratings are based on the methodology in Chapter 4 above.

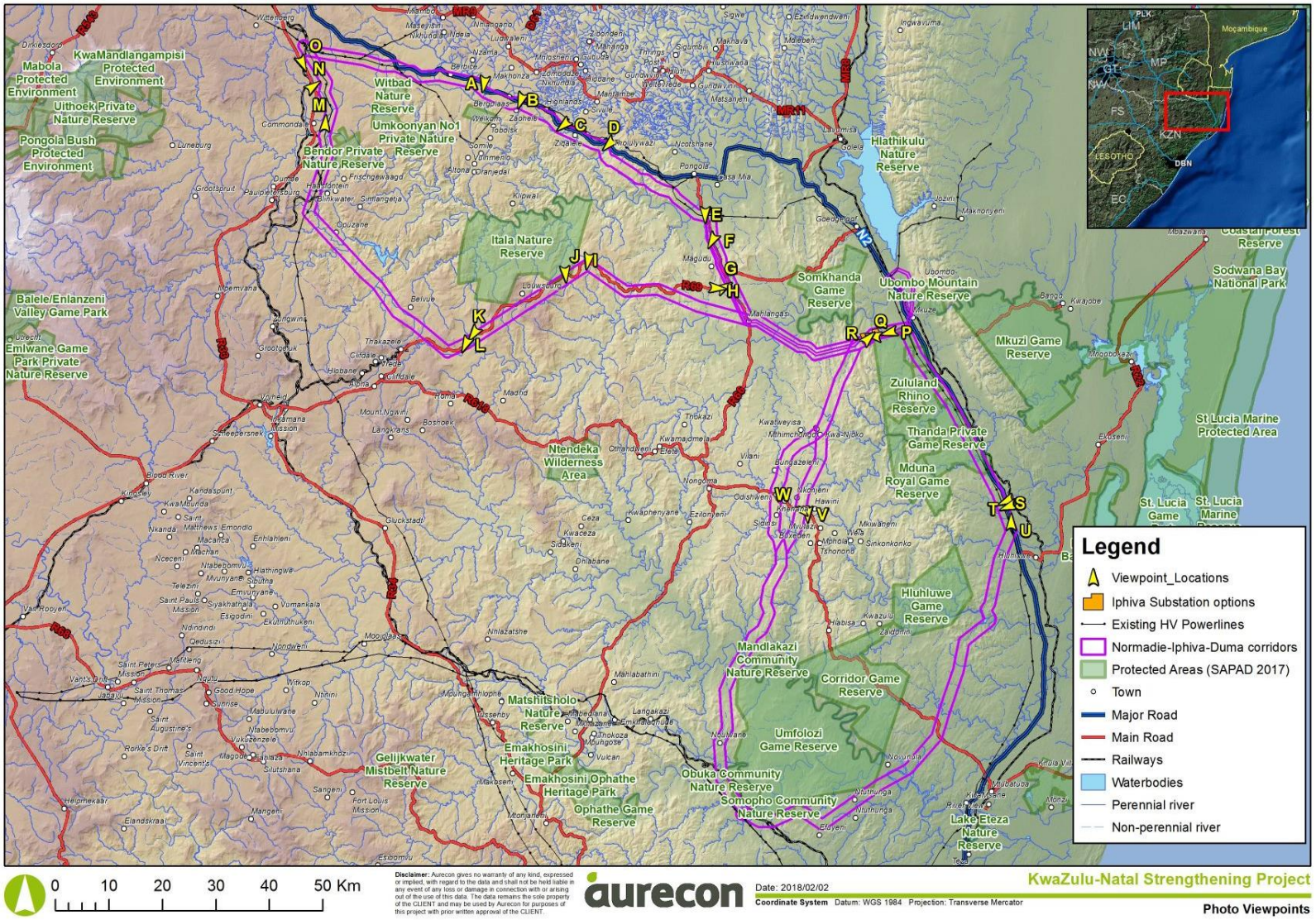

Figure 6-1: Location of representative photo viewpoints in relation to the study area

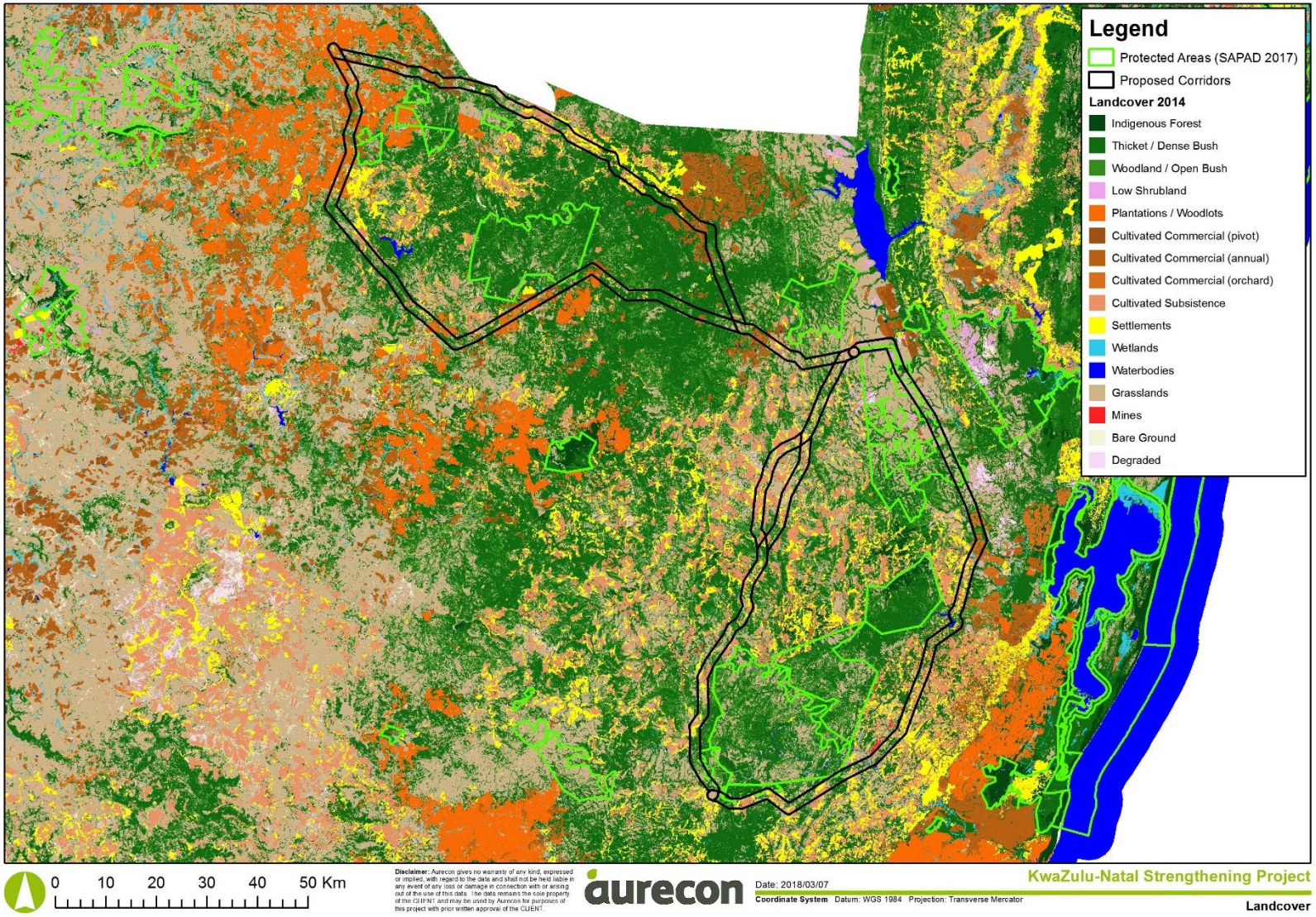

Figure 6-2: Land cover of the study area

6.2 Iphiva Substation Site

The receiving environment for the two potential Iphiva Substation sites is discussed here, and then compared in table format to select the site with the lower sensitivity (thus the preferred alternative).

6.2.1 Iphiva 3

The Iphiva 3 site along the P-234 road has a moderate slope, with natural vegetation cover consisting mostly of scrubland. Most importantly, it is directly adjacent to the Manyoni Private Game Reserve, and visible from various important vantage points in this reserve.

Figure 6-3: View along P-234 road close to proposed Iphiva Substation Site 3 (Viewpoint P)

6.2.2 Iphiva 6

The Iphiva 6 site along the P-234 road has a moderate slope, with bare soil associated with the dispersed rural settlement in which it occurs. The landscape is therefore largely transformed. It is expected that the viewer sensitivity of the settlement is low.

Figure 6-4: View along P-234 road close to proposed Iphiva Substation Site 6 (Viewpoint R)

6.2.3 Summary of existing environment of alternatives

The existing environment for the two alternative sites is compared in Table 6-2.

Table 6-2: Summary of Existing Environment: Iphiva Substation alternatives

Receiving environment parameter	**Site 3**	Description	**Site 6**	Description
Landscape character (main land cover / uses)	**% of site represented**	The landscape is largely unmodified, and remains natural grassland / low shrubland, with a small area of subsistence crops. Directly adjacent (north of) Manyoni Private Game Reserve.	**% of site represented**	The landscape is largely transformed due to dispersed rural settlement, but remains rural. Manyoni Private Game Reserve is approximately 1,7 km east of the site.
Grasslands	**51%**		5%	
Low shrubland	40%		18%	
Cultivated subsistence crops	7%		24%	
Woodland/Open bush	0.6%		0%	
Degraded	0.5%		0%	
Settlements	0%		**53%**	
Sense of Place	The site has rolling topography, with deep ravines, and generally slopes from east down to west. P-234 forms the southern boundary of the site. Open bush savannah does not provide an especially unique sense of place.		Due to the existing dispersed rural settlement of this study area, the sense of place is not unique. Such settlement pattern commonly occur across northern KZN. The east-west ridge creates a visual barrier between north and south.	
Landscape quality rating	2	Although disturbed, the area is largely natural (unmodified) and therefore of a moderate to high	1	Due to the existing informal settlement, this area is classified as "transformed human intervention" and

Receiving environment parameter	Site 3	Description	Site 6	Description
		landscape quality rating		therefore of low landscape quality
Visual Absorption Capacity (VAC) rating	**1.67**	**Low to moderate VAC**	**1.50**	**Low to moderate VAC**
VAC Topography	2	Slope between 3 - 7%	2	Slope between 3 -7%
VAC pattern/diversity	1	Uniform visual pattern, due to undeveloped area	1.5	Moderate diverse visual pattern, due to the rural informal settlement
VAC vegetation height	2	Vegetation height between 1-5m	1	Vegetation height <1m
Receptor sensitivity	**Sum of receptor sensitivity elements is score of 5/21**		**Sum of receptor sensitivity elements is score of 3/21**	
National / provincial road users (N2 / R33 / R69 / R66) [gravel D / P roads]	2	N2 not present. Smaller road users of gravel road (close to Nature Reserve) likely not used to disturbed / transformed environment	n/a	N2 not present. Smaller road users at informal settlement likely used to disturbed / transformed environment
Formal settlements (such as Pongola / Mkuze / Ulundi)	n/a		n/a	
Informal settlements / villages	n/a		1	
Rural (commercial farming) homesteads	n/a	It appears there are no rural homesteads in close proximity to this alternative	n/a	It appears there are no rural homesteads in close proximity to this alternative
Protected areas: Private: Lodge locations in Rhino Reserve complex (including Zululand Rhino, Thanda, Somkhanda and propose Zimanga Nature Reserves)	3	High receptor sensitivity (directly adjacent to 1 major conservation complex and income-generating potential of the landscape as visual resources)	2	Moderate receptor sensitivity (1,7 km from 1 major conservation complex and income-generating potential of the landscape as visual resources)
Protected areas: Private: Lodge locations in Ithala Reserve	n/a		n/a	
Protected areas: Public: Hluhluwe-Umfolozi complex	n/a		n/a	
Concluding statement (receiving environment)	Higher landscape quality rating of two alternatives. Higher receptor sensitivity rating of two alternatives. VAC similar. **Higher visual sensitivity**		Lower landscape quality rating of two alternatives. Lower receptor sensitivity rating of two alternatives. VAC similar. **Lower visual sensitivity**	

Conclusion: The Iphiva Substation Site 6 has the lowest visual sensitivity of the two alternatives.

6.4 Normandie-Iphiva 400 kV Powerline

The receiving environment for the two potential Normandie-Iphiva corridors is discussed here, and then compared in table format to select the site with the lower sensitivity (thus the preferred alternative).

6.4.1 Corridor 2 (ABFGD)

The general landscape of the Normandie-Iphiva 2 corridor is dominated mostly by the proximity to the N2 highway and intermittent rural settlements dotted along most of its length. The north western stretch has significant forestry activities in the region and likely contributes to noticeable bulk transport trucking on the N2. Most of the south eastern section (south of Pongola) has some sugar cane cultivation but becomes game farms and pristine bushveld as the corridor traverses more rugged and hilly terrain. Viewpoint C illustrates the mountainous terrain along the N2 as well as the rural settlements in the northern parts of the corridor. Viewpoint E is in the low-lying areas south of Pongola where fewer settlements but more cultivation occurs.

Figure 6-5: Disturbed landscape character along the N2 close to Zigalele (Viewpoint C)

Figure 6-6: Disturbed landscape with existing powerline south of Pongola (Viewpoint E)

6.4.2 Corridor 3 (AEFGD)

The extensive forestry operations in the region of Piet Retief dominate this area and extend all the way southward to Paulpietersburg and its surroundings. Forestry trucks and associated machinery are very common on the R33. The forestry and farmland landscape in Viewpoint M is typical of this area. A high voltage powerline and servitude already exists for this stretch of the Normandie-Iphiva 3 corridor. The corridor turns south eastward to cross some very mountainous terrain until it meets up with the R69 road and generally follows the road eastwards. The R69 itself traverses a mountainous path but is also very scenic. A few farmsteads dot the landscape but the region is predominantly game farms and nature reserves including the Ithala Nature Reserve. The corridor has a common path with Normandie-Iphiva 2 near the village of Mahlangasi until it reaches the Iphiva Substation.

Figure 6-7: View of pasture-dominated landscape close to Commondale (Viewpoint M)

Figure 6-8: View of natural rugged landscape along the R69 (Viewpoint L)

Figure 6-9: Landscape character close to Ithala Nature Reserve (Viewpoint I)

6.4.3 Summary of existing environment of alternatives

The existing environment for the two Normandie-Iphiva 400 kV alternatives is compared in Table 6-3.

Table 6-3: Summary of Existing Environment: Normandie-Iphiva 400 kV alternatives

Receiving environment parameter	**N-I 2 (ABFGD)**	Description	**N-I 3 (AEFGD)**	Description
Landscape character (main land cover / uses)	**% of corridor represented**	The landscape is somewhat disturbed with thicket and dense bush dominating (apart from the N2), and remains rural, with some infrastructure and urban areas. Few protected areas. 23% cultivated land.	**% of corridor represented**	The landscape is largely unmodified (apart from the provincial roads), and remains rural, with little infrastructure and urban areas. Several protected areas are present. Only 12% cultivated land.
Thicket /Dense bush	**27%**		**27%**	
Grasslands	20%		21%	
Woodland/Open bush	15%		20%	
Cultivated subsistence crops	12%		7%	
Cultivated commercial crops (non-pivot)	10%		6%	
Settlements	9%		3%	
Sense of Place	The N2 is a dominating feature, with the transmission line present but mostly obscured by topography (steep slopes). Dispersed rural settlements are very prominent. Little unique sense of place.		Forestry and game farming dominates the alignment, with limited agriculture, and steep slopes. Little unique sense of place, but the mountainous terrain provides scenic character.	
Landscape quality rating	2	Moderately transformed landscape, but	2.5	Moderately transformed landscape, but

Receiving environment parameter	N-I 2 (ABFGD)	Description	N-I 3 (AEFGD)	Description
		with some disturbance due to the N2, existing transmission line and rural infrastructure elements		with few man-made visual elements apart from infrastructure
Visual Absorption Capacity (VAC) rating	**2.17**	**Moderate VAC**	**2.00**	**Moderate VAC**
VAC Topography	3	Slope >7%	3	Slope >7%
VAC pattern/diversity	1.5	A uniform visual pattern, with the exception of the N2, existing transmission line and small settlements	1	A uniform visual pattern, with the exception of the provincial and district roads
VAC vegetation height	2	Vegetation height between 1-5m	2	Vegetation height between 1-5m
Receptor sensitivity rating	**Sum of receptor sensitivity elements: 8/21**		**Sum of receptor sensitivity elements: 12/21**	
National / provincial road users (N2 / R33 / R69 / R66) [gravel D / P roads excluded]	1	N2 and smaller road users and settlement dwellers are used to disturbed / transformed environment	1.5	N2 not present. Smaller road users and settlement dwellers are used to disturbed / transformed environment
Formal settlements (such as Pongola / Mkuze / Ulundi)	1		1	
Informal settlements / villages	1		1	
Rural (commercial farming) homesteads	2	Numerous rural homesteads with high sense of attachment to the landscape, but infrastructure disturbance (towns and roads)	2.5	Numerous rural homesteads with high sense of attachment to the landscape and few other visual disturbance
Protected areas: Private: Lodge locations in Rhino Reserve complex (including Zululand Rhino, Thanda, Somkhanda and propose Zimanga Nature Reserves)	3	Moderate to high receptor sensitivity (2 major conservation areas, and income-generating potential of the landscape as visual resources)	3	High receptor sensitivity (3 major conservation areas, and income-generating potential of the landscape as visual resources)
Protected areas: Private: Lodge locations in Ithala Reserve	n/a		3	
Protected areas: Public: Hluhluwe-Umfolozi complex	n/a		n/a	
Concluding statement (receiving environment)	Lower landscape quality rating of two alternatives. Lower receptor sensitivity rating of two alternatives. VAC similar. **Lower visual sensitivity**		Higher landscape quality rating of two alternatives. Higher receptor sensitivity rating of two alternatives. VAC similar. **Higher visual sensitivity**	

Conclusion: The Normandie-Iphiva alignment 2 has the lowest visual sensitivity of the two alternatives.

6.5 Iphiva-Duma 400 kV Powerline

The receiving environment for the two potential Iphiva-Duma corridors is discussed here, and then compared in table format to select the site with the lower sensitivity (thus the preferred alternative). From a visual resource perspective, the receiving environment of Iphiva Duma West 1 and West 2 is identical, with no preferred alternative. It is referred to further simply as "West" for this reason.

6.5.1 Western Corridor

The rugged mountainous landscape that Iphiva-Duma West traverses is continuous for almost its entire length. No major towns occur near the proposed corridors with sparse but clustered rural settlements found in the area as can be seen in Viewpoint W. Very little infrastructure is present with the only tarred road being the R618. Some subsistence crop farming is found in the valley floors with the hills mostly used as grazing fields. Extensive erosion scarring is also evident in those valleys near the rural settlements.

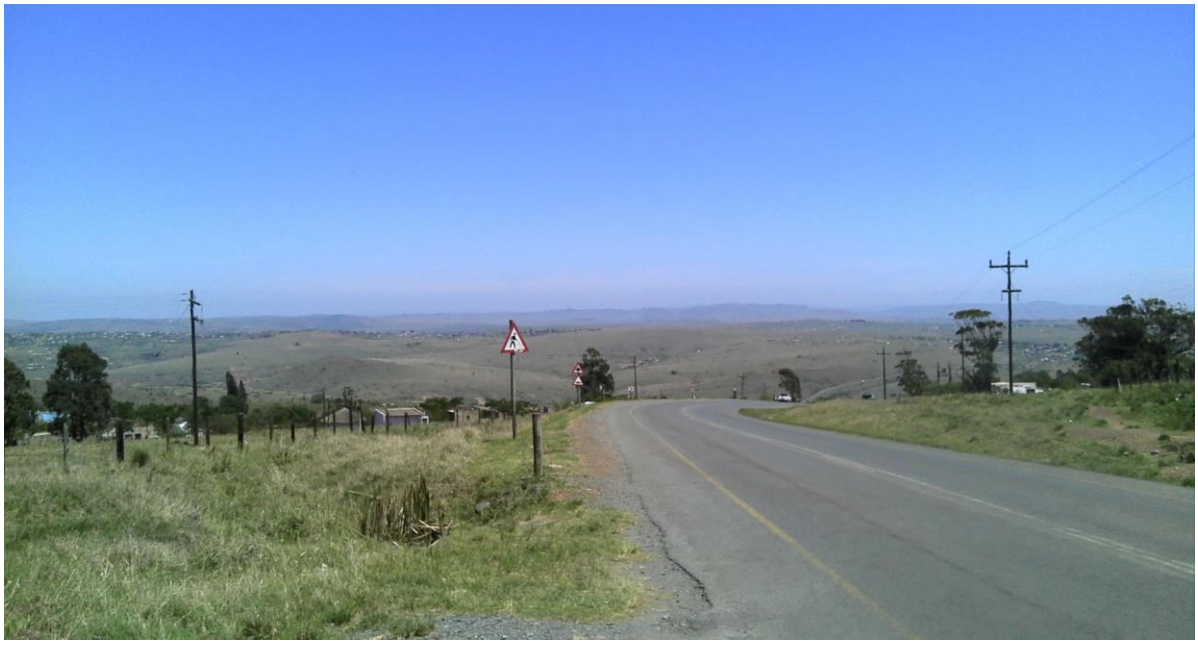

Figure 6-10: Grassland with dispersed rural settlement in Hawini (Viewpoint W)

6.5.2 Eastern Corridor

The landscape becomes notably less mountainous towards the east of the study area and the vegetation and habitat types become markedly more coastal. The N2 highway from Mkuze in the north to Hluhluwe in the south is a major feature of the landscape. Extensive tracts of land in this region are declared protected areas, including the Manyoni Private Game Reserve, Thanda Private Game Reserve, Mduna Royal Game Reserve, Hluhluwe Game Reserve, and Umfolozi Game Reserve, among others.

Figure 6-11: Typical landscape character along N2 (Eastern corridor) (Viewpoint S)

6.5.3 Summary of existing environment of alternatives

The existing environment for the two alternative alignments is compared in Table 6-4.

Table 6-4: Summary of Existing Environment: Iphiva-Duma 400 kV alternatives

Receiving environment parameter	**EAST**	Description	**WEST**	Description
Landscape character (main land cover / uses)	**% of site represented**	The landscape is largely unmodified with grasslands dominating. The N2, existing transmission line and a few informal settlements (south-east of Huhluwe compex) are the main development components. Numerous protected areas along the alignment. 18% cultivated land.	**% of site represented**	The landscape is rural, somewhat modified with grasslands dominating. Many dispersed rural settlements (and subsistence crops) dominate the central area. One protected area along the alignment. 16% cultivated land.
Thicket /Dense bush	24%		19%	
Grasslands	**35%**		**31%**	
Woodland/Open bush	10%		20%	
Cultivated subsistence crops	15%		16%	
Cultivated commercial crops (non-pivot)	3%		0%	
Settlements	0%		11%	
Sense of Place	A generally flat landscape, mostly dominated by unmodified natural areas (dense bush), except for the N2. Very little other infrastructure visible.		Rugged (steep sloped) terrain, with little formal infrastructure, dominated by dispersed rural settlement and natural	

Receiving environment parameter	EAST	Description	WEST	Description
	Not particularly unique, but with some scenic value.		bushland. Not particularly unique sense of place.	
Landscape quality rating	2.5	Largely unmodified landscape (due to conservation land use), but with some disturbance due to the N2, existing transmission line and small towns	2	A partially modified landscape, with some disturbance due to informal settlements and only one major conservation area.
Visual Absorption Capacity (VAC) rating	**2.00**	Moderate VAC	**2.17**	Moderate VAC
VAC Topography	2	Slope between 3 - 7%	3	Slope >7%
VAC pattern/diversity	1.5	A uniform visual pattern, with the exception of the N2, existing transmission line and small settlements	1.5	A uniform visual pattern, with the exception of the rural district roads and informal settlements
VAC vegetation height	2.5	Vegetation height between 3-5m	2	Vegetation height between 1-5m
Receptor sensitivity	Sum of receptor sensitivity elements is score of 10.5/21		Sum of receptor sensitivity elements is score of 8/21	
National / provincial road users (N2 / R33 / R69 / R66) [gravel D / P roads]	1	N2 and smaller road users and settlement dwellers are used to disturbed / transformed environment	n/a	N2 not present. Smaller road users and settlement dwellers are used to disturbed / transformed environment
Formal settlements (such as Pongola / Mkuze / Ulundi)	1		1	
Informal settlements / villages	n/a		1	
Rural (commercial farming) homesteads	2.5	Numerous rural homesteads (close to two conservation complexes) with high sense of attachment to the landscape and few other visual disturbance	1.5	Numerous rural homesteads (close to one conservation complex) with high sense of attachment to the landscape and few other visual disturbance
Protected areas: Private: Lodge locations in Rhino Reserve complex (including Zululand Rhino, Thanda, Somkhanda and proposed Zimanga Nature Reserves)	3	High receptor sensitivity (2 major conservation complexes, and income-generating potential of the	1.5	Moderate to high receptor sensitivity (1 major conservation area, and income-generating potential of the
Protected areas: Private: Lodge locations in Ithala Reserve	n/a		n/a	
Protected areas: Public: Hluhluwe-Umfolozi complex	3		3	

Receiving environment parameter	EAST	Description	WEST	Description
		landscape as visual resources)		landscape as visual resources)
Concluding statement (receiving environment)	Higher landscape quality rating of two alternatives. Highest receptor sensitivity rating of two alternatives. VAC similar. **Higher visual sensitivity**		Lower landscape quality rating of two alternatives. Lower receptor sensitivity rating of two alternatives. VAC similar. **Lower visual sensitivity**	

Conclusion: The Iphiva-Duma Western alignment has the lowest visual sensitivity of the two alternatives. The deviation proposed close to the Hluhluwe-Umfolozi protected area has an even lower visual sensitivity, as it is further from the park than the original corridor.

6.6 132 kV Distribution powerlines

The 132 kV powerline corridors are considered in the following manner:

- Pongola/Iphiva has no alternatives, and is described on its own.
- From Iphiva SS to Candover HV, the combination of the (a) Iphiva/Makhathini/Mbazwane 132 kV double circuit powerline, (b) Iphiva-Hluhluwe 132 kV powerline and (c) Candover Tie-in to existing 132 kV is considered as one project (for the purpose of visual baseline and impact).
    - This project has a Western and Eastern alternative between Mkuze and Candover.

6.6.1 Pongola/Iphiva

The proposed 132 kV powerline from the existing HV substation approximately south of Pongola to Mahlangasi along the R66 road, and on to the proposed Iphiva Substation has no alternative routing options.

- Up to Mahlangasi, it is not certain if the Normandie-Iphiva 400 kV (Alternative 2) will be proposed.
    - If N-I (3) is approved, only the Pongola/Iphiva 132 kV will cause a visual impact
    - If N-I (2) is approved, a cumulative visual impact will occur (both 132 kV and 400 kV).
- From Mahlangasi to Iphiva, the Normandie-Iphiva 400 kV powerline is proposed in the same corridor (whether N-I 2 or N-I 3), thus necessarily causing only a cumulative impact.
- Due to the uncertainty of the micro-alignment of these two powerlines within the 2 km wide corridor, cumulative assessment cannot be accurately undertaken.

Some sections of Section 6.4.1 above has reference – the corridor is the same for these two powerlines. Viewpoint E in Figure 6-6 shows the section of corridor along the R66 (with and existing distribution powerline in the background).

Table 6-5: Summary of Existing Environment: Pongola/Iphiva 132 kV powerline

Receiving environment parameter	Segment 1 (Pongola/Iphiva)	Description
Landscape character (main land cover / uses)	**% of site represented**	The landscape is mostly natural, but modified along the R66 (with a small distribution powerline running alongside). The corridor between Mahlangasi and Iphiva has more degraded land and dispersed rural settlement
Thicket /Dense bush	31%	
Grasslands	24%	
Woodland/Open bush	22%	
Cultivated commercial crops	9%	
Cultivated subsistence crops	9%	
Settlements	0%	
Sense of Place	The landscape remains rural, with little infrastructure apart from the R66. The R66 section is fairly flat. Rugged (steep sloped) terrain, with little formal infrastructure, dominated by dispersed rural settlement and natural bushland (for the last section). Not particularly unique sense of place.	
Landscape quality rating	2	A partially modified, rural landscape, with moderate diversity.
Visual Absorption Capacity (VAC) rating	**2.17**	Moderate VAC
VAC Topography	2	Slope between 3 -7%
VAC pattern/diversity	2	A uniform visual pattern with natural landscape, few other man-made structures
VAC vegetation height	2.5	Vegetation height between 1-5m
Receptor sensitivity	Sum of receptor sensitivity elements is score of 6/21	
National / provincial road users (N2 / R33 / R69 / R66) [gravel D / P roads]	1	Smaller road users (R66) and settlement dwellers are used to disturbed / transformed environment
Formal settlements (such as Pongola / Mkuze / Ulundi)	1	
Informal settlements / villages	1	
Rural (commercial farming) homesteads	2	Commercial farming homesteads present along R66. Not many such homesteads expected on second section of corridor
Protected areas: Existing lodge locations in Rhino Reserve Complex (including Zululand Rhino, Thanda, Somkhanda and proposed Zimanga Nature Reserves)	1	Low receptor sensitivity (only Somkhanda Game Reserve at distance outside the corridor
Protected areas: Existing lodge locations in Ithala Reserve and Private Nature Reserves (such as Bendor, Welkom and Witbad Private Nature Reserves)	n/a	
Protected areas: Existing lodge locations: Hluhluwe-Umfolozi Complex	n/a	
Concluding statement (receiving environment)	**Moderate** landscape quality rating. **Low** receptor sensitivity rating.	

6.6.2 Iphiva/Makhathini/Mbazwane

The receiving environment for the two alternatives of the Iphiva/Makhathini/Mbazwane double-circuit corridors is discussed here. These alternative corridors are referred to as **East** and **West**. They are then compared in table format to select the alternative with the lower sensitivity (thus the preferred alternative).

(a) Iphiva/Makhathini/Mbazwane AND Iphiva-Hluhluwe

The Iphiva/Makhathini/Mbazwane 132 kV double circuit powerline AND the Iphiva-Hluhluwe 132 kV powerline is proposed along the P-234 road between the proposed Iphiva Substation and Mkuze HV Substation. This corridor will likely have these two distribution powerlines, and possibly a transmission powerline.

The corridor is situated between an existing (Manyoni Private Game Reserve) and proposed (Zimanga Nature Reserve) protected area, both of which have high viewer / receptor sensitivity due to the importance of the landscape as visual resource. Tourism income is linked to this resource.

(b) Iphiva/Makhathini/Mbazwane WEST (Mkuze Northwards)

From Mkuze, the western alignment runs parallel to an existing railway line for some of its length to the Candover HV Substation. It is further in close proximity (i.e. less than 600 m) from the N2. As a result, this visual quality of this infrastructure corridor is already lowered. The land it crosses over is fairly flat, and dominated by sugarcane. The proposed Zimanga Nature Reserve runs along the western edge of the N2. At its closest, this corridor alternative is about 300 m from the N2 (and thus the border of Zimanga).

Note: *The existing and proposed lodge / bird hide positions of Zimanga were requested from the owner but not received by the time of submission for this report.*

(c) Iphiva/Makhathini/Mbazwane EAST (Mkuze Northwards)

From Mkuze, the eastern alignment runs directly north. There is comparatively little infrastructure along this corridor. The land it crosses over is the mid-slope of a long ridge-line, and appears to be mostly natural. It passes a few commercial farming homesteads.

(d) Candover HV Tie-in to existing 132 kV

This short stretch of powerline (less than 1 km) is required to tie in to the existing 132 kV line running within the proposed Zimanga Nature Reserve in a north-south orientation. An existing 132 kV tie-in powerline (east-west orientation) means the visual sensitivity in this location is already lowered.

(e) Summary of existing environment of alternatives

The existing environment for the two alternative alignments (North of Mkuze) is compared in Table 6-6.

Table 6-6: Summary of Existing Environment: 132 kV alternatives

Receiving environment parameter	Segment 2 (Iphiva/Mkuze / Candover (double circuit) [WEST]	Description	Segment 2 (Iphiva/Mkuze / Candover (double circuit) [EAST]	Description
Landscape character (main land cover / uses)	**% of corridor represented**	The landscape from Iphiva to Mkuze along the P234 is largely unmodified, with grasslands dominating. After passing by Mkuze, there is greater disturbance with agriculture (arable and irrigated) dominating the landscape. It follows the existing rail alignment, and in close proximity to the N2. It remains rural, with within the infrastructure corridor.	**% of corridor represented**	The landscape from Iphiva to Mkuze along the P234 is largely unmodified, with grasslands dominating. After passing by Mkuze, irrigated agriculture with woodland dominates, including some rural residential homesteads.
Thicket /Dense bush	10%		19%	
Grasslands	**38%**		**36%**	
Woodland/Open bush	8%		11%	
Cultivated commercial crops	**30%**		**21%**	
Low shrubland	6%		6%	
Cultivated subsistence crops	5%		4%	
Sense of Place	From Iphiva, the rolling topography and open bush savannah does not provide an especially unique sense of place. From Mkuze northwards, the arable agriculture combined with the N2 and railway provides more developed state on flat terrain, with little uniqueness.		From Iphiva, the rolling topography and open bush savannah does not provide an especially unique sense of place. From Mkuze northwards, the irrigated cropland, rural homesteads, ruggedness of the ridge to the east, and thicket/dense bush provides a moderate sense of place.	
Landscape quality rating	1.5	A partially modified, flat agricultural landscape, with little diversity.	2.5	A partially modified, undulating natural landscape, with prominent ridgeline to its east.
Visual Absorption Capacity (VAC) rating	**1.50**	Low to Moderate VAC	**1.83**	Moderate VAC
VAC Topography	1	Slope between 0 -3%	2	Slope between 3 - 7%
VAC pattern/diversity	1.5	A uniform visual pattern with agricultural use, close to the N2 and railway line.	1	A uniform visual pattern with natural landscape, few other man-made structures

VAC vegetation height	2	Vegetation height between 1-5m	2.5	Vegetation height between 1-5m
Receptor sensitivity	Sum of receptor sensitivity elements is score of 6.5		Sum of receptor sensitivity elements is score of 5.5	
National / provincial road users (N2 / R33 / R69 / R66) [gravel D / P roads]	1	N2 as well as existing railway line present north of Mkuze. Mkuze residents likely used to disturbed / transformed environment	1	N2 not relevant north of Mkuze. Mkuze residents likely used to disturbed / transformed environment
Formal settlements (such as Pongola / Mkuze / Ulundi)	1		1	
Informal settlements / villages	n/a		n/a	
Rural (commercial farming) homesteads	1.5	Commercial farming homesteads present, likely visibility to both alignments. Due to existing disturbance (N2 and Rail), likely lower receptor sensitivity to the west.	2.5	Commercial farming homesteads present, likely visibility to both alignments. Due to the natural landscape and prominent ridge, likely higher receptor sensitivity to the east.
Protected areas: Existing lodge locations in Rhino Reserve Complex (including Zululand Rhino, Thanda, Somkhanda and proposed Zimanga Nature Reserves)	3	High receptor sensitivity (1 major conservation complex). *Visibility from lodge locations was not determined.*	1	Although Critical Biodiversity Area (CBA), no formal protection status
Protected areas: Existing lodge locations in Ithala Reserve and Private Nature Reserves (such as Bendor, Welkom and Witbad Private Nature Reserves)	n/a		n/a	
Protected areas: Existing lodge locations: Hluhluwe-Umfolozi Complex	n/a		n/a	
Concluding statement	Lower landscape quality rating of two alternatives (north of Mkuze). Higher receptor		Higher landscape quality rating of two alternatives (north of Mkuze). Lower receptor sensitivity rating of	

(receiving environment)	sensitivity rating of two alternatives. VAC similar. **Similar overall visual sensitivity.**	two alternatives. VAC similar. **Similar overall visual sensitivity.**

Between the two alternatives, there is no clear preferred alternative from a visual perspective. However, the principle of consolidating visual impact along existing infrastructure corridors would favour the Western Alternative.

7. IMPACT ASSESSMENT

Environmental Impact Assessment Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended by Appendix 6 of GN 326 of 7 April 2017:

1. (1) A specialist report prepared in terms of these Regulations must contain—

(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;
(g) an identification of any areas to be avoided, including buffers;
(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;
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;

The approach, methods have been described in chapter 4 above. From a visual impact perspective, the visibility, visual intrusion and visual exposure will be discussed here for each application. The viewshed maps in this section combines the concepts of *visibility* and *visual exposure* as defined in Chapter 4 above to derive the *visual magnitude* of the expected impact.

7.1 Project components relevant to visual impact

To identify the potential risk sources that may result in impacts on the visual environment, certain of the technical specifications and project components of the above-mentioned applications are provided here, although it is discussed in greater detail in the main EIRs of the four applications.

(a) Transmission powerlines

The following lattice suspension tower structure types (Figure 7-1), will typically be used for transmission powerlines. Final tower types will be determined after surveying and profiling of the various alignments:

- 518 Lattice tower series (self-supporting);
- 520 Guyed Vee lattice towers;
- 529 Cross-rope lattice tower; and
- 515 Guyed-V lattice towers.
- Due to its heavier footing design, the 518-lattice tower will visually be more obtrusive.

Towers usually support one powerline, but in cases of extreme constraints, two powerlines of different voltages can also be supported on one set of multi-circuit towers. The tower height will be between 21 m and 32 m, and spacing between 250 m and 500 m apart.

The minimum working area required for the erection of a self-supporting strain tower is 40 m by 40 m, and for a cross-rope suspension tower is 50 m by 50 m. If the area is bushveld, then it will be cleared, but if it is grassland, then it will just be trampled by activities.

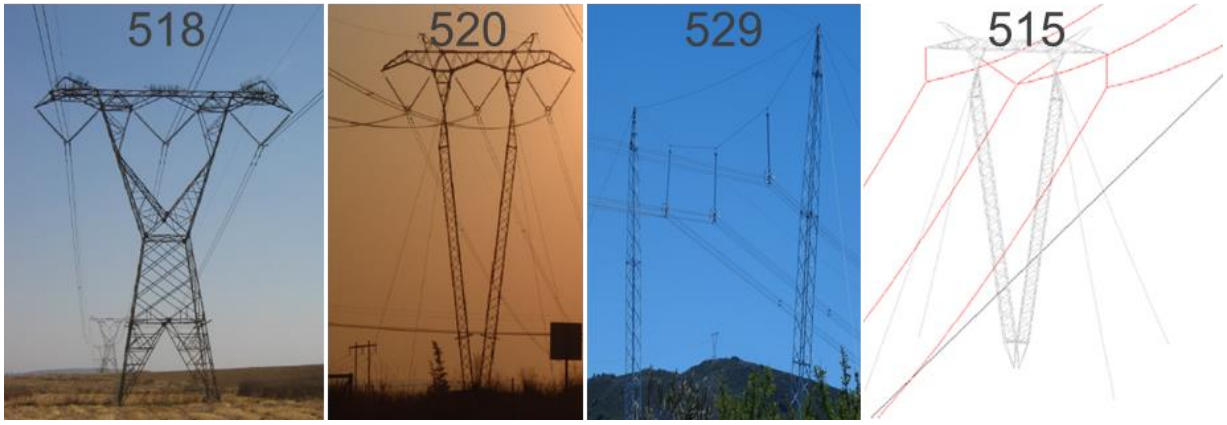

Figure 7-1: Typical 400 kV pylon structures

(b) Iphiva Substation

The proposed Iphiva Substation will have a 400 m x 400 m footprint. It is composed of standard electrical equipment such as transformers, reactors, busbars and isolators. It will have a microwave radio communication mast that could be up to 80 m high. Due to Civil Aviation Association (CAA) safety regulations, it is likely that the mast will have a red light on its highest point. The site has to be levelled before construction can commence, and a flat site is therefore preferable. The substation needs to be lit at night for safety and security reasons. The security lighting will be around the substation fence, the luminaire height is 4 m, and will be operated with a trigger from the non-lethal fence.

(c) Distribution powerlines

Monopole structures (steel or concrete) will likely be used (whether guyed or free-standing) of between 18 m and 24 m in height (See Figure 7-2). The choice of self-supporting or guyed tower types will be determined to suit the slope, terrain and founding conditions. Double-circuit structures are required in many instances for this project, with some use of single-circuits, details of which will only be determined in the final design stages by ESKOM.

(d) Access Roads

Vehicle access is usually required along the entire route for construction, maintenance and operation purposes. Existing roads will be used as far as possible and the construction of roads and bridges will be kept to the minimum.

(e) Cleared servitude

There will be clearing of vegetation beneath the proposed powerlines. An 8 m wide strip directly under the position of the powerline will be cleared of all vegetation for construction purposes.

(f) Construction camps and laydown areas

The establishment of construction camps will take place along the route. Construction camps also include the clearing of vegetation for material and equipment laydown areas. The exact position of the construction camps will be negotiated with the relevant landowners.

Figure 7-2: Typical 132 kV Distribution powerline structures

7.2 Identification of impacts

The identified visual impacts of the infrastructure components of the four applications on the various receptor groups (with varying sensitivity) is summarised in the following tables. The unique identifiers are then used for impact assessment later in the chapter.

The tables in each section of this chapter present the general visual impact for each application as they related to the various receptor groupings along each of the alignments, as the visual impact differs between receptor groups and across applications (project components).

7.2.1 Visual impacts related to typical construction activities

Access Roads

The potential visual impacts associated with construction and maintenance of access roads are related to the need to clear vegetation and carry out minor changes to the topography. The clearance of vegetation has the greatest potential to produce visual impacts. Clearing of vegetation especially in long straight lengths impacts on the sense of place, visual quality and landscape character.

Clearing of servitudes

The potential visual impacts associated with the initial clearing and ongoing maintenance of servitudes are related to the need to clear vegetation over a certain height as they could pose a fire risk to the transmission line. The clearing of vegetation would most likely result in a loss of visual quality and reduced visual absorption capacity along the servitude.

Construction camps and laydown areas

The potential visual impacts of construction camps and laydown areas relate to the possible clearing of vegetation and the foreign scale and aesthetics of the structures, security and stockpiled materials.

7.3 Iphiva Substation Site

Impacts and mitigation measures in this report are relevant to all the listed activities included in the application for the Iphiva Substation.

7.3.1 Interpretation of viewshed maps

The legend on the viewshed maps in this section should be interpreted as follows:

a) Under normal circumstances, the viewshed applies to a maximum 7 km distance from substation. Due to the radio mast – the viewshed has been increased to 10 km for the substation sites;
b) The viewshed is based on line of sight modelling (i.e. ground level) to the top of the infrastructure;
c) White colour (i.e. low visual magnitude/intensity) means that at least 1 tower is visible from one place at the outer edges of the viewshed (6-7 km away).
d) Yellow colour (i.e. moderate visual magnitude/intensity) means that approximately 6-8 towers are visible from one place at a moderate distance (3-5 km away)
e) Red colour (i.e. high visual magnitude/intensity) means that approximately 15 towers are visible from one place in close proximity (1-2 km away).

7.3.2 Identification of impacts and determination of intensity / magnitude

By analysis of the viewshed maps created (**figures below**), the intensity of each visual impact was calculated and is presented in tables below. The intensity of these will be carried forward to the impact assessment tables at the end of this chapter.

Table 7-1: Impact Identification: Iphiva Substation

Impact number	Impact description
V-IS-1	Visual impact as a result of the Iphiva Substation on: > National / provincial road users (N2 / R33 / R69 / R66) > Formal settlements (such as Mkhuze) > Informal settlements / villages
V-IS-2	Visual impact as a result of the Iphiva Substation on: > Rural (commercial farming) homesteads

V-IS-3	Visual impact as a result of the Iphiva Substation on: > Protected areas: > Protected areas: Existing lodge locations in Rhino Reserve Complex (including Zululand Rhino, Thanda, Somkhanda and proposed Zimanga Nature Reserves)
V-IS-4	Visual impact as a result of the **night-time light** of the Iphiva Substation on nearby Protected area receptors

Table 7-2: Comparative visual impact intensity - identified impacts for Iphiva Substation

Impact no.	Impact Assessment Parameter	Site 3	Description	Site 6	Description
V-IS-1	**Visibility** (viewshed analysis) AND Visual Exposure (How far is the activity from viewers)	3	Refer to viewshed map	3	Refer to viewshed map
	Visual Intrusion (how project fits environment)	2	No similar existing infrastructure	2	Some disturbance due to settlement already present
	Intensity / Magnitude (1-5) before mitigation	**4**		**4**	
V-IS-2	**Visibility** (viewshed analysis) AND Visual Exposure (How far is the activity from viewers)	2	Refer to viewshed map - no farming homesteads in close proximity	2	Refer to viewshed map - no farming homesteads in close proximity
	Visual Intrusion (how project fits environment)	2	No similar existing infrastructure	2	Some disturbance due to settlement already present
	Intensity / Magnitude (1-5) before mitigation	**3**		**3**	
V-IS-3	**Visibility** (viewshed analysis) AND Visual Exposure (How far is the activity from viewers)	3	Refer to viewshed map - high visibility for Rhino Reserve	2	Refer to viewshed map - low visibility for proected areas
	Visual Intrusion (how project fits environment)	2	No similar existing infrastructure	2	Some disturbance due to settlement already present
	Intensity / Magnitude (1-5) before mitigation	**4**		**3**	
V-IS-4	**Visibility** (viewshed analysis) AND Visual Exposure (How far is the activity from viewers)	2	Refer to viewshed map - radio mast m ain impact - site lighting only 4 m high	2	Refer to viewshed map - radio mast m ain impact - site lighting only 4 m high
	Visual Intrusion (how project fits environment)	2	No similar existing infrastructure	2	Some disturbance due to settlement already present
	Intensity / Magnitude (1-5) before mitigation	**3**		**3**	

7.3.3 Iphiva 3

The primary impact will be on the Manyoni Private Game Reserve (as sensitive receptor due to conservation land use).

- Figure 7-6 shows the overall viewshed for the Site 3 alternative.

Due mainly to topography, the impact on the proposed Zimanga Private Reserve will be negligible.

7.3.4 Iphiva 6

The primary impact will be on the Manyoni Private Game Reserve (as sensitive receptor due to conservation land use).

- Figure 7-7 shows the overall viewshed for the Site 6 alternative.

7.3.5 Visibility analysis of both alternatives from specific points in Manyoni Private Game Reserve

The figures below show visibility analyses (viewpoint to impact area) from the high points in the MPGR, the roads of the MPGR, and scenic views (i.e. lodge locations) to substation alternatives. This illustrates the preference for Site 6, which is less visible than Site 3.

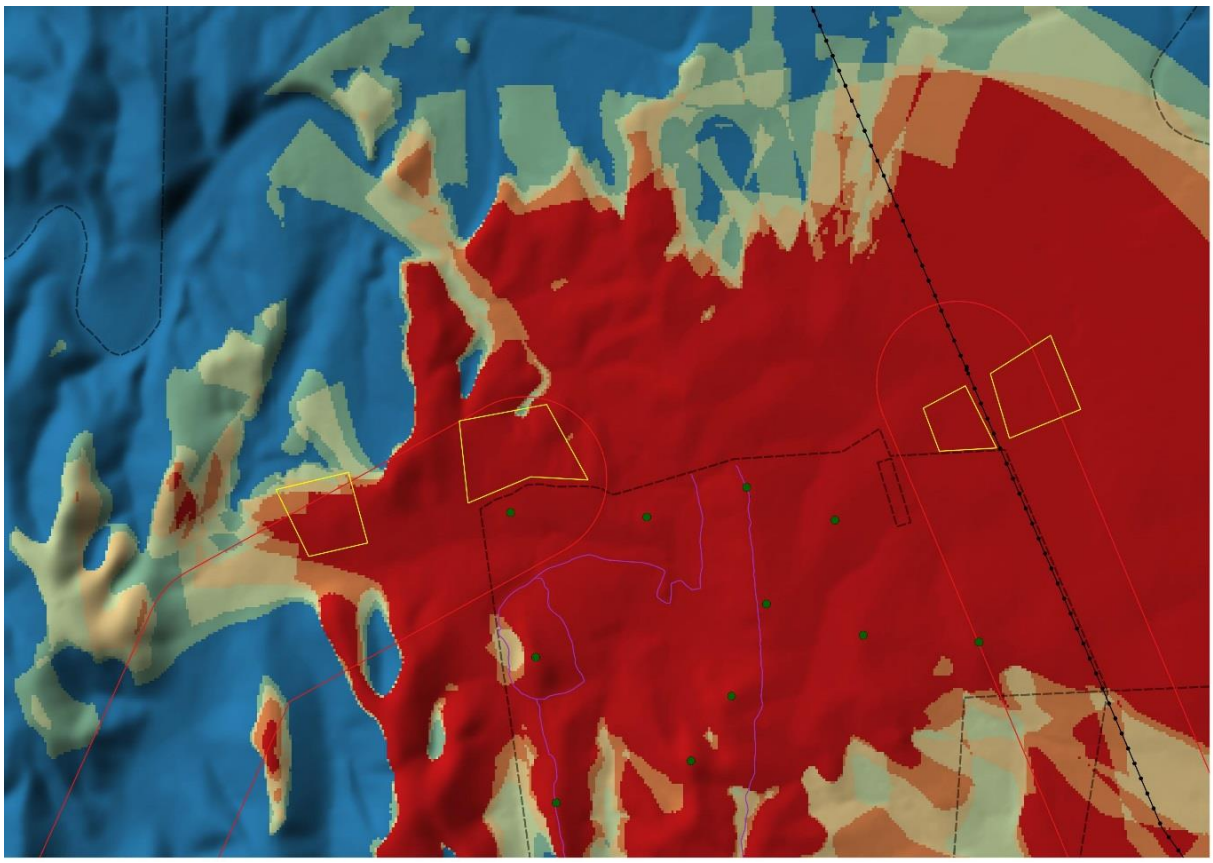

Figure 7-3: Visibility analysis from high points in MPGR to substation alternatives

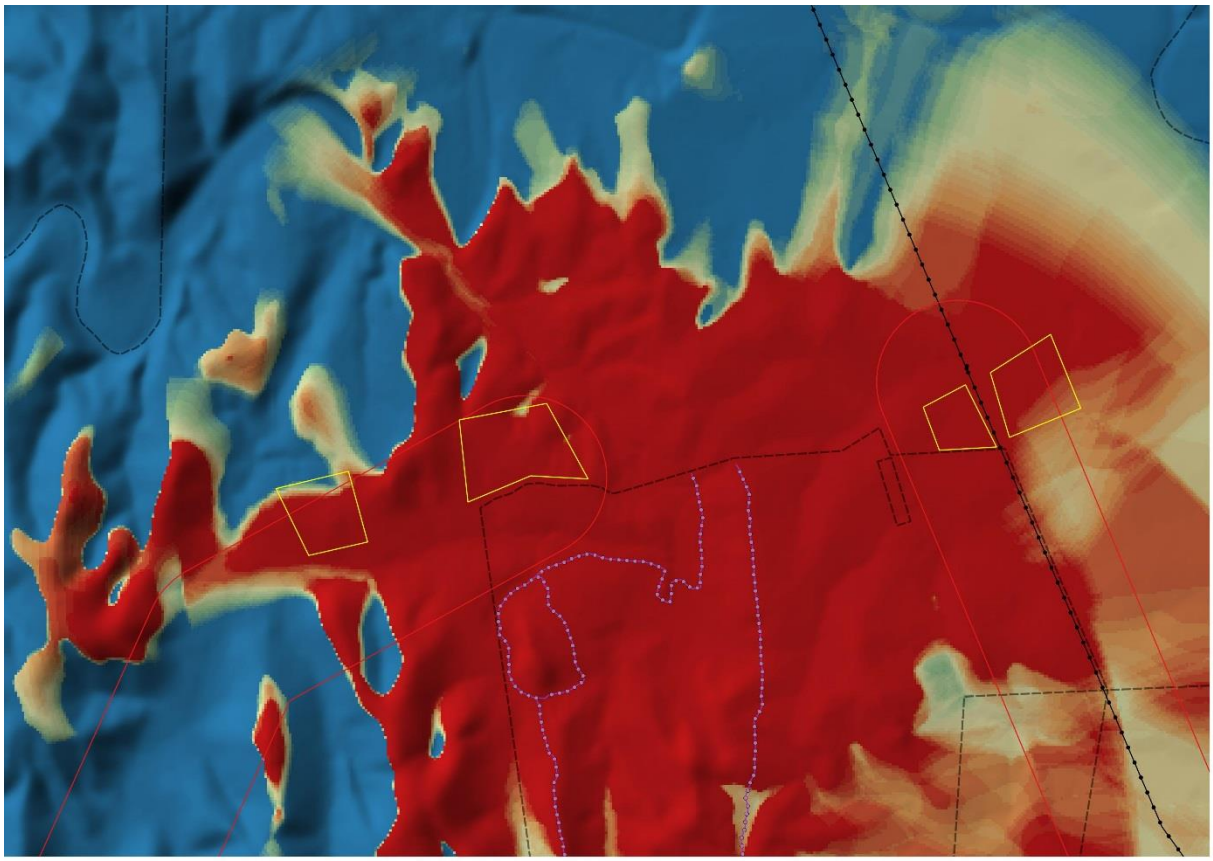

Figure 7-4: Visibility analysis from game drive roads in MPGR to substation alternatives

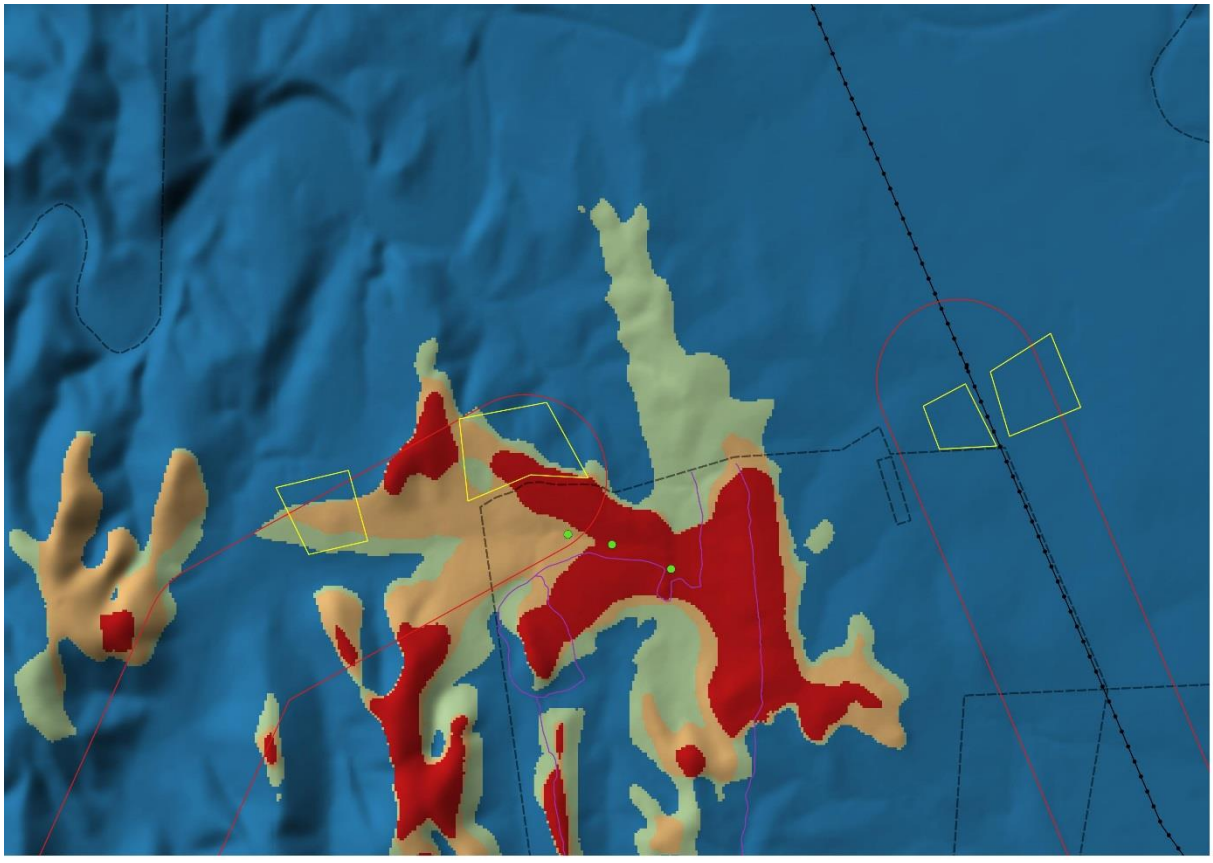

Figure 7-5: Visibility analysis from scenic points in MPGR to substation alternatives

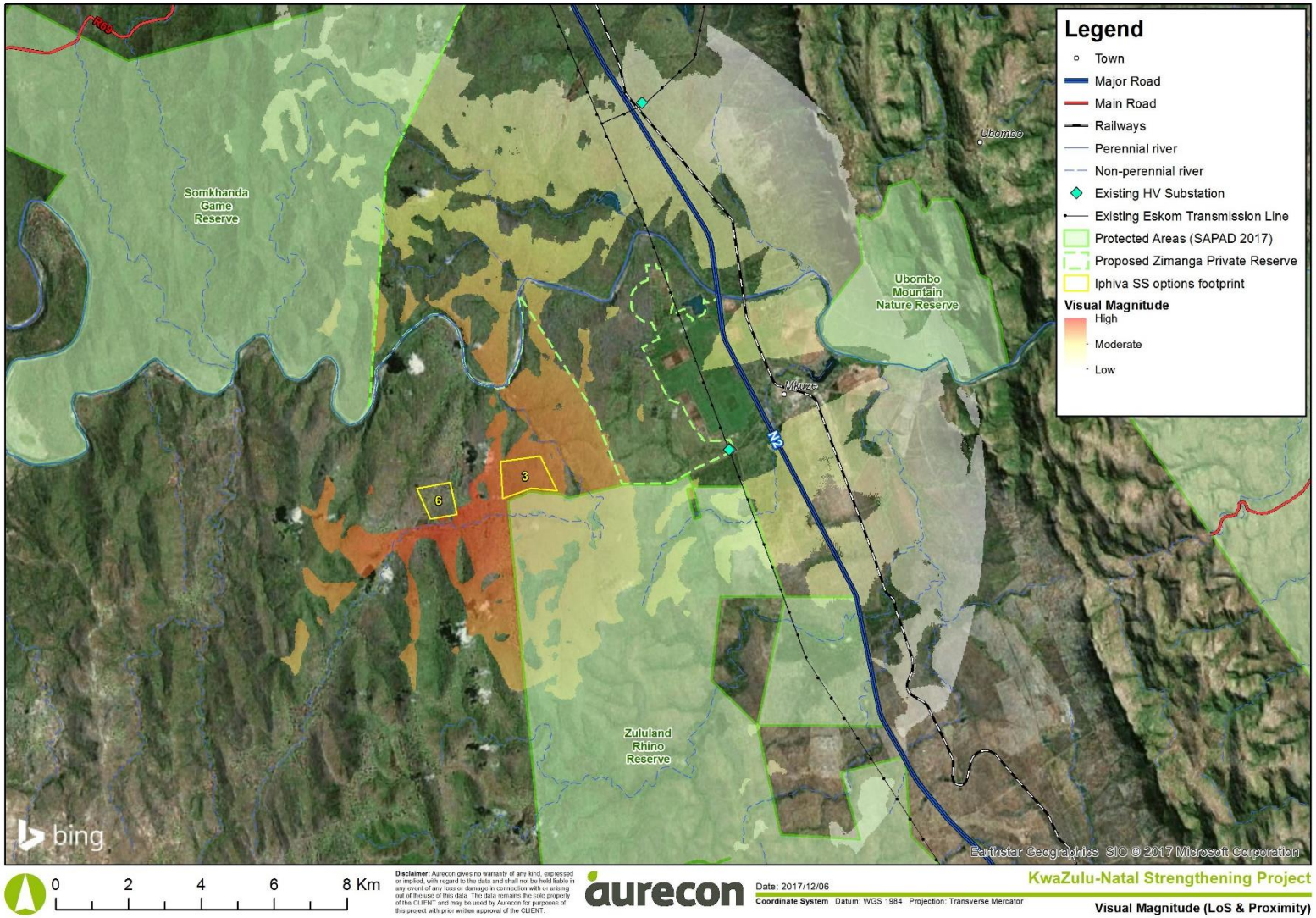

Figure 7-6: Viewshed of Iphiva Substation (Site 3 Alternative)

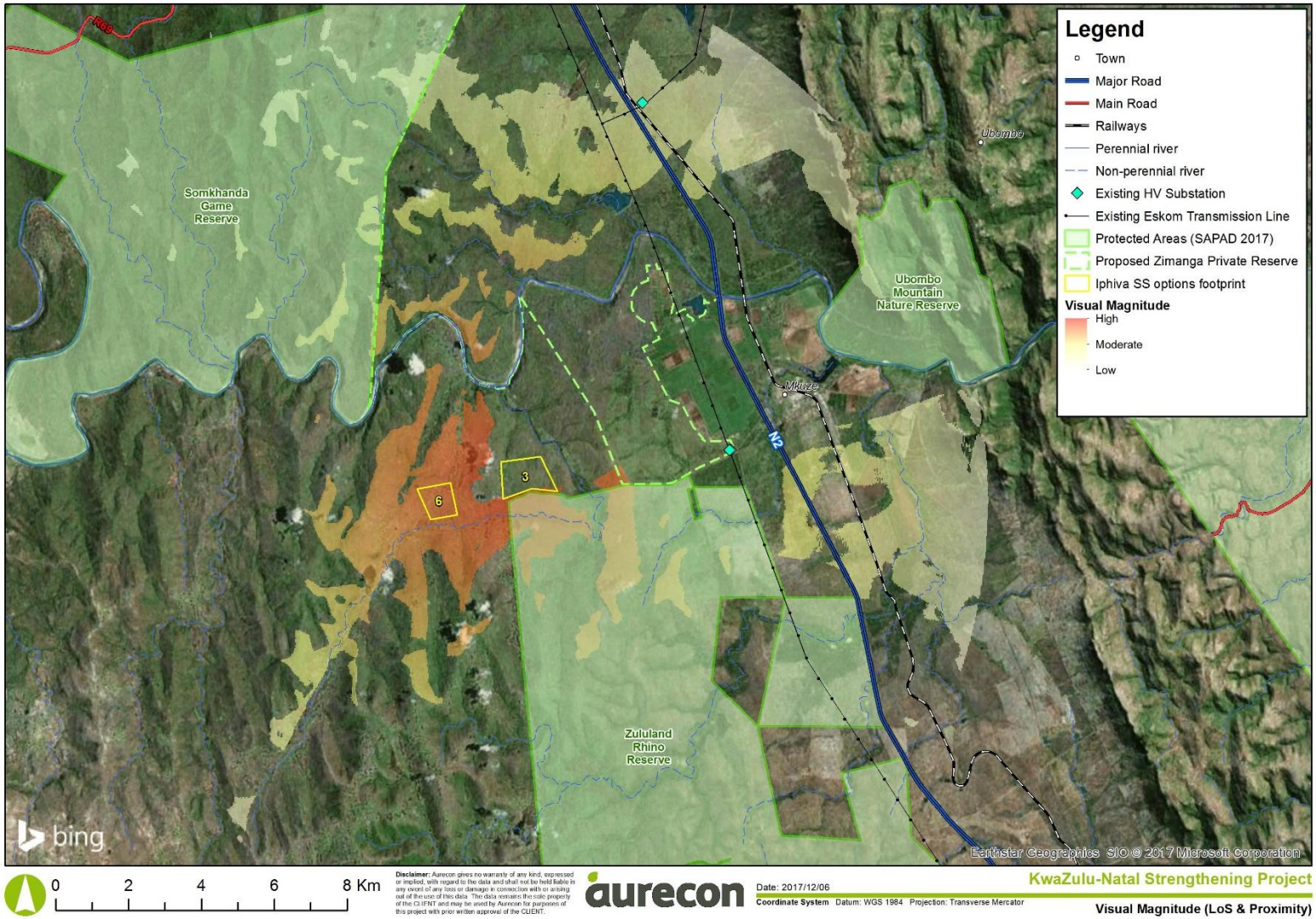

Figure 7-7: Viewshed of Iphiva Substation (Site 6 Alternative)

7.3.6 Preferred alternative

Site 6 is preferred, based on numerous visibility analyses, taking into account scenic points, existing/known lookout points and game drive routes in Manyoni Private Game Reserve, which is the closest game reserve to the two sites.

7.4 Normandie-Iphiva 400 kV Powerline

Impacts and mitigation measures in this report are relevant to all the listed activities included in the application.

7.4.1 Interpretation of viewshed maps

The legend on the viewshed maps in this section should be interpreted as follows:

f) Under normal circumstances, the viewshed applies to a maximum 7 km distance from centerline of the transmission line;
g) The viewshed is based on line of sight modelling (i.e. ground level) to the top of the infrastructure;
h) White colour (i.e. low visual magnitude/intensity) means that at least 1 tower is visible from one place at the outer edges of the viewshed (6-7 km away).
i) Yellow colour (i.e. moderate visual magnitude/intensity) means that approximately 6-8 towers are visible from one place at a moderate distance (3-5 km away)
j) Red colour (i.e. high visual magnitude/intensity) means that approximately 15 towers are visible from one place in close proximity (1-2 km away).

7.4.2 Identification of impacts and determination of intensity / magnitude

By analysis of the viewshed maps created (**figures below**), the intensity of each visual impact was calculated and is presented in tables below. The intensity of these will be carried forward to the impact assessment tables at the end of this chapter.

Table 7-3: Impact Identification: Normandie-Iphiva 400 kV line

Impact number	Impact description
V-NIT-1	Visual impact as a result of the Normandie-Iphiva 400 kV line on: > National / provincial road users (N2 / R33 / R69 / R66) > Formal settlements (such as Pongola / Mkhuze / Ulundi) > Informal settlements / villages
V-NIT-2	Visual impact as a result of the Normandie-Iphiva 400 kV line on: > Rural (commercial farming) homesteads
V-NIT-3	Visual impact as a result of the Normandie-Iphiva 400 kV line on: > Protected areas: Existing lodge locations in Rhino Reserve Complex (including Zululand Rhino, Thanda, Somkhanda and proposed Zimanga Nature Reserves)
V-NIT-4	Visual impact as a result of the Normandie-Iphiva 400 kV line on: > Protected areas: Private: Existing lodge locations in Ithala Reserve and Private Nature Reserves (such as Bendor, Welkom and Witbad Private Nature Reserves)

Table 7-4: Comparative visual impact intensity of identified impacts – Normandie Iphiva

Impact no.	Impact Assessment Parameter	N-I 2 (ABFGD)	Description	N-I 3 (AEFGD)	Description
V-NIT-1	**Visibility** (viewshed analysis) INCLUDING Visual Exposure (How far is the activity from viewers)	1.5	Refer to viewshed map	2	Refer to viewshed map
	Visual Intrusion (how project fits environment)	2	N2 and existing transmission line	2.5	No similar existing infrastructure
	Intensity / Magnitude (1-5) before mitigation	**3**		**4**	
V-NIT-2	**Visibility** (viewshed analysis) INCLUDING Visual Exposure (How far is the activity from viewers)	2	Refer to viewshed map	2	Refer to viewshed map
	Visual Intrusion (how project fits environment)	1.5	N2 and existing transmission line	3	No similar existing infrastructure
	Intensity / Magnitude (1-5) before mitigation	**3**		**4**	
V-NIT-3	**Visibility** (viewshed analysis) INCLUDING Visual Exposure (How far is the activity from viewers)	2	Refer to viewshed map	2	Refer to viewshed map
	Visual Intrusion (how project fits environment)	3	N2 and existing transmission line	3	No similar existing infrastructure
	Intensity / Magnitude (1-5) before mitigation	**4**		**4**	
V-NIT-4	**Visibility** (viewshed analysis) INCLUDING Visual Exposure (How far is the activity from viewers)	2	Refer to viewshed map	2.5	Refer to viewshed map
	Visual Intrusion (how project fits environment)	1	N2 and existing transmission line	2.5	No similar existing infrastructure
	Intensity / Magnitude (1-5) before mitigation	**3**		**4**	

7.4.3 Preferred alternative

The N-I 2 alternative is preferred. Existing settlements, disturbed areas and electricity transmission infrastructure along the N2 has a low landscape quality rating, and associated receptor (viewer) sensitivity.

The N-I 3 alternative has a higher landscape quality rating, more conservation areas, and therefore a higher receptor sensitivity rating. This receptor sensitivity is linked to rural homesteads as well as the tourism industry associated with conservation areas such as Itala Game Reserve.

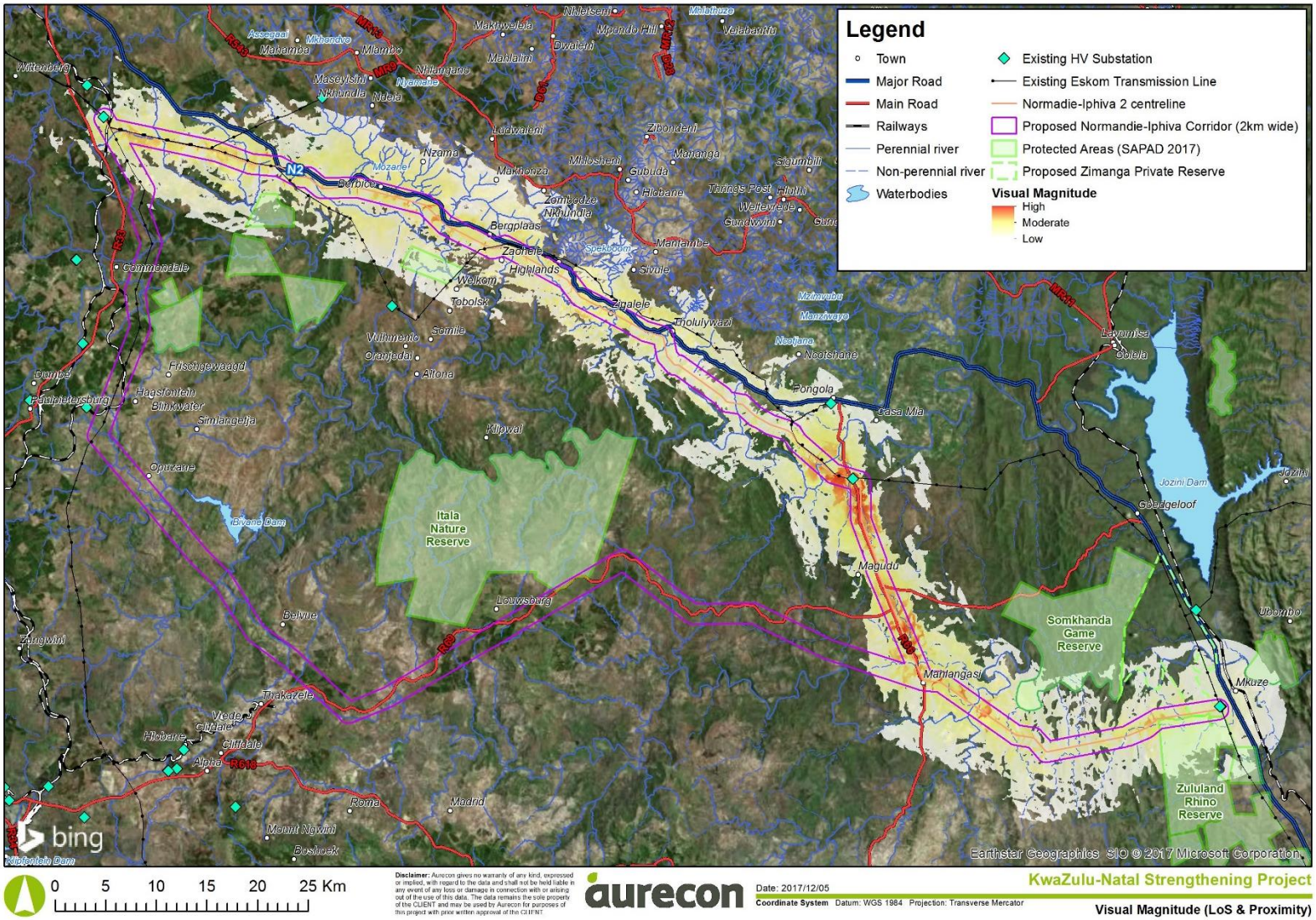

Figure 7-8: Viewshed of Normandie-Iphiva powerline (Alternative 2)

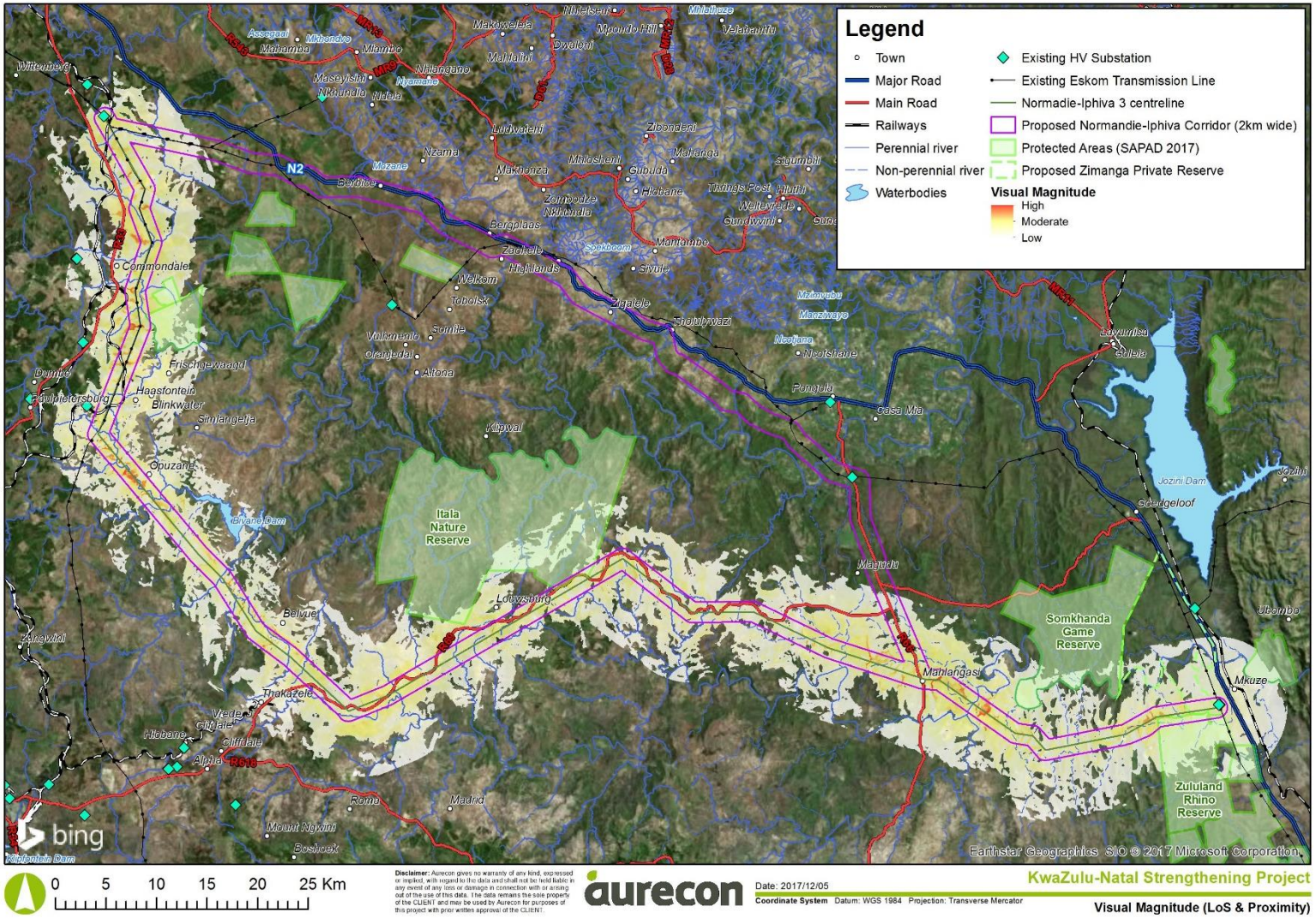

Figure 7-9: Viewshed of Normandie-Iphiva powerline (Alternative 3)

7.5 Iphiva-Duma 400 kV Powerline

Impacts and mitigation measures in this report are relevant to all the listed activities included in the application.

7.5.1 Interpretation of viewshed maps

The legend on the viewshed maps in this section should be interpreted as follows:

k) Under normal circumstances, the viewshed applies to a maximum 7 km distance from centerline of the transmission line;
l) The viewshed is based on line of sight modelling (i.e. ground level) to the top of the infrastructure;
m) White colour (i.e. low visual magnitude/intensity) means that at least 1 tower is visible from one place at the outer edges of the viewshed (6/7 km away).
n) Yellow colour (i.e. moderate visual magnitude/intensity) means that approximately 6-8 towers are visible from one place at a moderate distance (5/4 km away)
o) Red colour (i.e. high visual magnitude/intensity) means that at least 15 towers are visible from one place in close proximity (less than 3 km away).

7.5.2 Identification of impacts and determination of intensity / magnitude

By analysis of the viewshed maps created, the intensity of each visual impact was calculated and is presented in tables below. The intensity of these will be carried forward to the impact assessment tables at the end of this chapter.

Table 7-5: Impact Identification: Iphiva-Duma 400 kV line

Impact number	Impact description
V-IDT-1	Visual impact as a result of the Normandie-Iphiva 400 kV line on: > National / provincial road users (N2 / R33 / R69 / R66) > Formal settlements (such as Pongola / Mkhuze / Ulundi) > Informal settlements / villages
V-IDT-2	Visual impact as a result of the Normandie-Iphiva 400 kV line on: > Rural (commercial farming) homesteads
V-IDT-3	Visual impact as a result of the Normandie-Iphiva 400 kV line on: > Protected areas: Existing lodge locations in Rhino Reserve Complex (including Zululand Rhino, Thanda, Somkhanda and proposed Zimanga Nature Reserves)
V-IDT-4	Visual impact as a result of the Normandie-Iphiva 400 kV line on: > Protected areas: Existing lodge locations: Hluhluwe-Umfolozi Complex

Table 7-6: Comparative visual impact intensity of identified impacts – Iphiva Duma

Impact no.	Impact Assessment Parameter	EAST	Description	WEST	Description
V-IDT-1	**Visibility** (viewshed analysis) AND Visual Exposure (How far is the activity from viewers)	2	Refer to viewshed map	2	Refer to viewshed map
	Visual Intrusion (how project fits environment)	2	N2 and Existing transmission line present	2	Many dispersed rural settlements present, but not similar infrastructure
	Intensity / Magnitude (1-5) before mitigation	**3**		**3**	
V-IDT-2	**Visibility** (viewshed analysis) AND Visual Exposure (How far is the activity from viewers)	2	Refer to viewshed map	2	Refer to viewshed map
	Visual Intrusion (how project fits environment)	3	Fewer dispersed rural settlements present	2	Many dispersed rural settlements present, but not similar infrastructure
	Intensity / Magnitude (1-5) before mitigation	**4**		**3**	
V-IDT-3	**Visibility** (viewshed analysis) AND Visual Exposure (How far is the activity from viewers)	3	Refer to viewshed map	2	Refer to viewshed map
	Visual Intrusion (how project fits environment)	2	Similar infrastructure present, but through protected areas	2	Similar infrastructure present, but fewer protected areas
	Intensity / Magnitude (1-5) before mitigation	**4**		**3**	
V-IDT-4	**Visibility** (viewshed analysis) AND Visual Exposure (How far is the activity from viewers)	3	Refer to viewshed map	2	Refer to viewshed map
	Visual Intrusion (how project fits environment)	2	Corridor in close proximity to Protected area	2	Corridor further from protected area
	Intensity / Magnitude (1-5) before mitigation	**4**		**3**	

7.5.3 Preferred alternative

The I-D West alternative(s) is preferred (no preference for 1 or 2). Existing dispersed rural settlements along the western corridor (1 and 2) lowers the landscape quality rating of the western alignments, when compared to the Eastern alternatives.

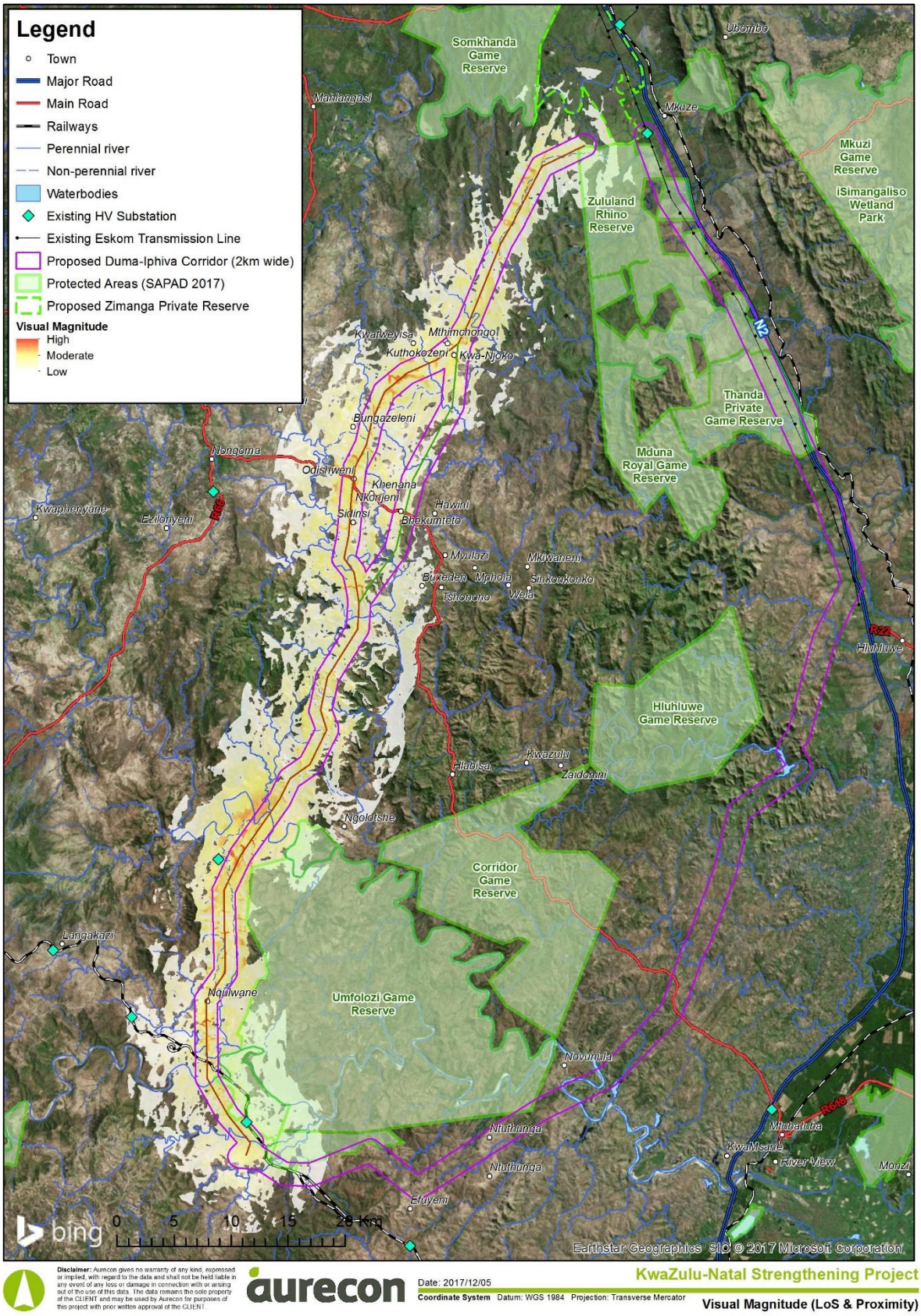

Figure 7-10: Viewshed of Iphiva-Duma powerline (Alternative WEST 1)

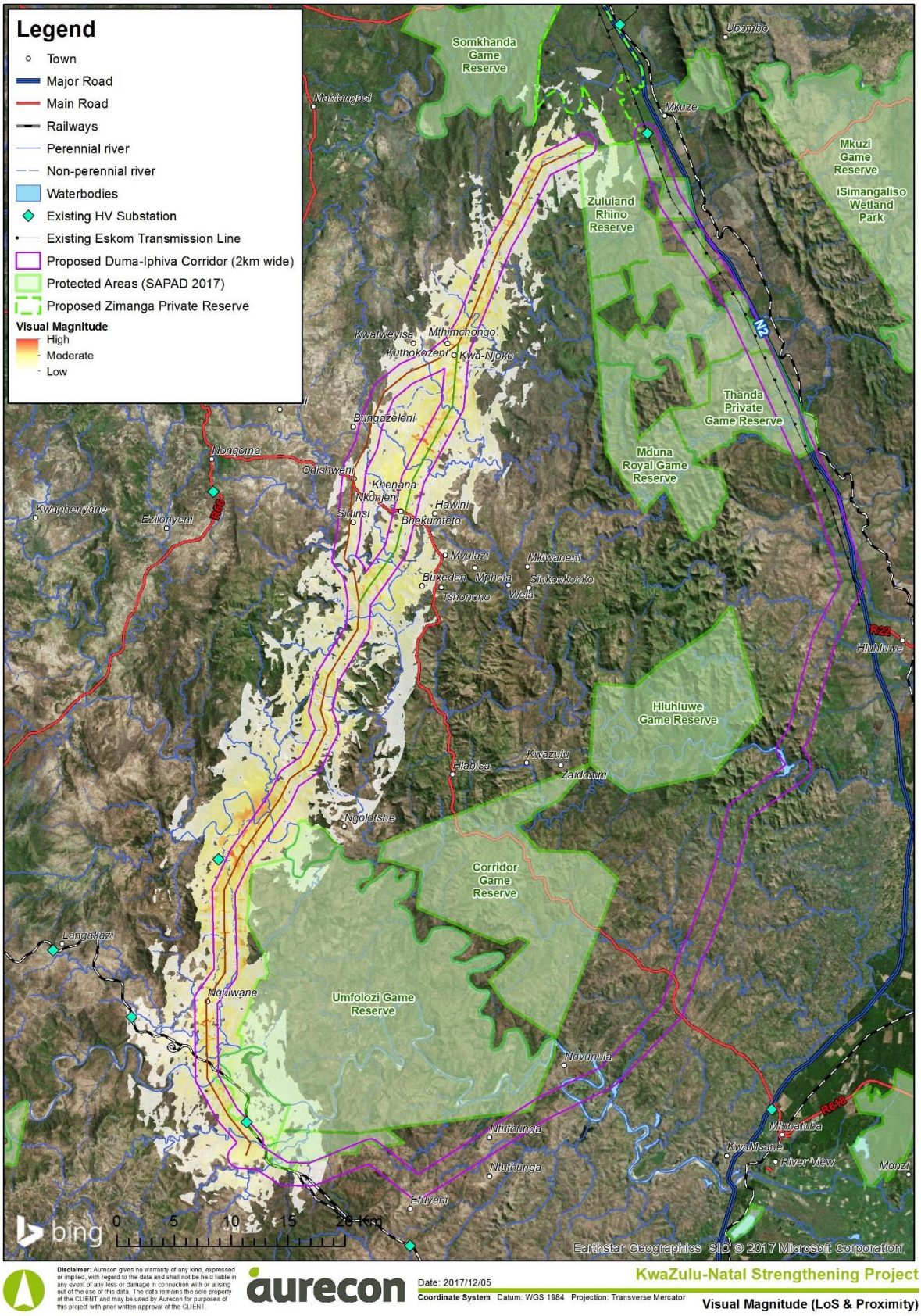

Figure 7-11: Viewshed of Iphiva-Duma powerline (Alternative WEST 2)

7.6 132 kV Distribution powerlines

Impacts and mitigation measures in this report are relevant to all the listed activities included in the application.

7.6.1 Interpretation of viewshed maps

The legend on the viewshed maps in this section should be interpreted as follows:

p) Under normal circumstances, the viewshed applies to a maximum 7 km distance from centerline of the transmission line;
q) The viewshed is based on line of sight modelling (i.e. ground level) to the top of the infrastructure;
r) White colour (i.e. low visual magnitude/intensity) means that at least 1 tower is visible from one place at the outer edges of the viewshed (6/7 km away).
s) Yellow colour (i.e. moderate visual magnitude/intensity) means that approximately 6-8 towers are visible from one place at a moderate distance (5/4 km away)
t) Red colour (i.e. high visual magnitude/intensity) means that at least 15 towers are visible from one place in close proximity (less than 3 km away).

7.6.2 Identification of impacts and determination of intensity / magnitude

By analysis of the viewshed maps created (**figures below**), the intensity of each visual impact was calculated and is presented in tables below. The intensity of these will be carried forward to the impact assessment tables at the end of this chapter.

Table 7-7: Impact Identification: 132kV distribution powerlines

Impact no.	Impact description
V-Dx-1	Visual impact as a result of the (a) Iphiva/Makhathini/Mbazwane 132 kV double circuit powerline AND (b) Iphiva-Pongola 132 kV powerline to tie into existing line, double circuit with Iphiva-Hluhluwe 132 kV powerline along the P-234 road to Mkuze (**See Figure 7-10 and 7-11**)
V-Dx-2	Visual impact as a result of the (a) Iphiva/Makhathini/Mbazwane 132 kV double circuit powerline, from Mkuze northwards to tie in with Candover HV substation (**WEST or EAST**) (**See Figure 7-10 and 7-11**)
V-Dx-3	Visual impact as a result of the Candover Switching Station to existing 132 kV powerline (**See Figure 7-10 and 7-11**)
V-Dx-4	Visual impact as a result of the Iphiva-Pongola 132kv powerline (**no alternatives**) in the Normandie-Iphiva 2 km corridor. (**See Figure 7-9**)

Table 7-8: Comparative visual impact intensity - Iphiva / Makhathini / Mbazwane 132kV AND Iphiva / Pongola / Hluhluwe double circuit distribution powerlines

Impact no.	Impact Assessment Parameter	Iphiva/ Makhathini/ Mbazwane (double) AND Iphiva-Pongola-Hluhluwe (double) along P234	Description
V-Dx-1	**Visibility** (viewshed analysis) AND Visual Exposure (How far is the activity from viewers)	2.5	Refer to viewshed map
	Visual Intrusion (how project fits environment)	2	Along P-234, road present, but conservation land use.
	Intensity / Magnitude (1-5) before mitigation	**4**	

Table 7-9: Comparative visual impact intensity – Iphiva / Makhathini / Mbazwane 132 kV double circuit powerline, from Mkuze northwards to tie in with Candover HV substation (WEST or EAST)

Impact no.	Impact Assessment Parameter	Iphiva/ Makhathini/ Mbazwane (double) from Mkuze northwards (WEST)	Description	Iphiva/ Makhathini/ Mbazwane (double) from Mkuze northwards (EAST)	Description
V-Dx-2	**Visibility** (viewshed analysis) AND Visual Exposure (How far is the activity from viewers)	2	Refer to viewshed map	2.5	Refer to viewshed map
	Visual Intrusion (how project fits environment)	1.5	In section north of Mkuze, other infrastructure present (road/rail), SOME rural homesteads present, Zimanga nature reserve	2	In section north of Mkuze, little other infrastructure present, AND numerous rural homesteads present, Pongola Nature Reserve
	Intensity / Magnitude (1-5) before mitigation	**3**		**4**	

Table 7-10: Comparative visual impact intensity - Candover Switching Station to existing 132 kV powerline

Impact no.	Impact Assessment Parameter	Candover Switching to 132 kV	Description
V-Dx-3	**Visibility** (viewshed analysis) AND Visual Exposure (How far is the activity from viewers)	2	Low visual intensity, but still in nature reserve (i.e. Zimanga)
	Visual Intrusion (how project fits environment)	2	Existing 132 kV tie-in powerline (east-west orientation), nevertheless conservation land use.
	Intensity / Magnitude (1-5) before mitigation	**3**	

Table 7-11: Comparative visual impact intensity - Iphiva-Pongola 132kv powerline (no alternatives) in the Normandie-Iphiva 2 km corridor.

Impact no.	Impact Assessment Parameter	Iphiva/Pongola 132 kV line	Description
V-Dx-4	**Visibility** (viewshed analysis) AND Visual Exposure (How far is the activity from viewers)	1	No significant views from nature reserves
	Visual Intrusion (how project fits environment)	1.5	Along R66 road, similar infrastructure present. In last section, dispersed rural settlement dominates. Few rural homesteads. No nature reserves in close proximity.
	Intensity / Magnitude (1-5) before mitigation	**2**	

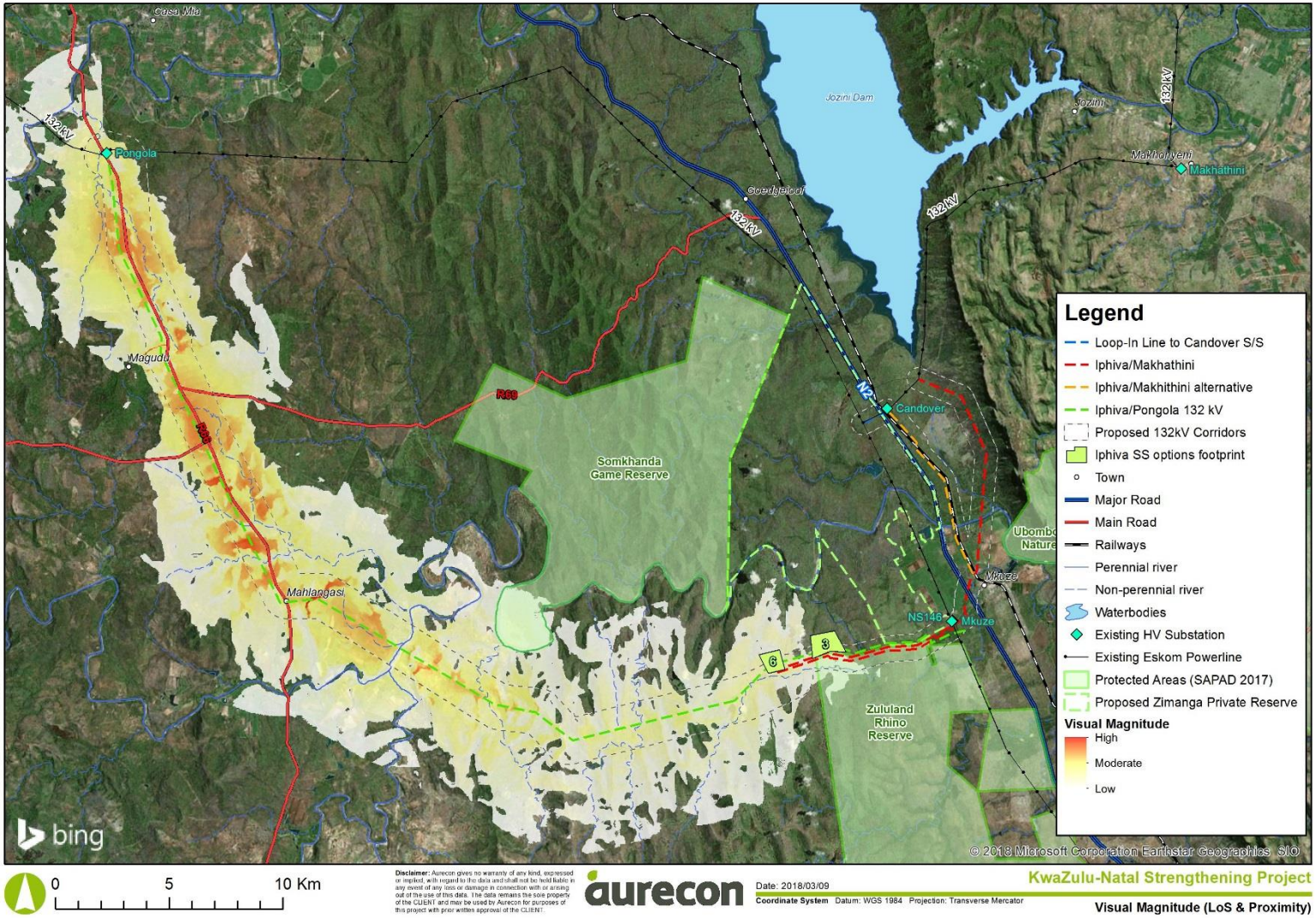

Figure 7-12: Viewshed of Pongola-Iphiva 132 kV powerline

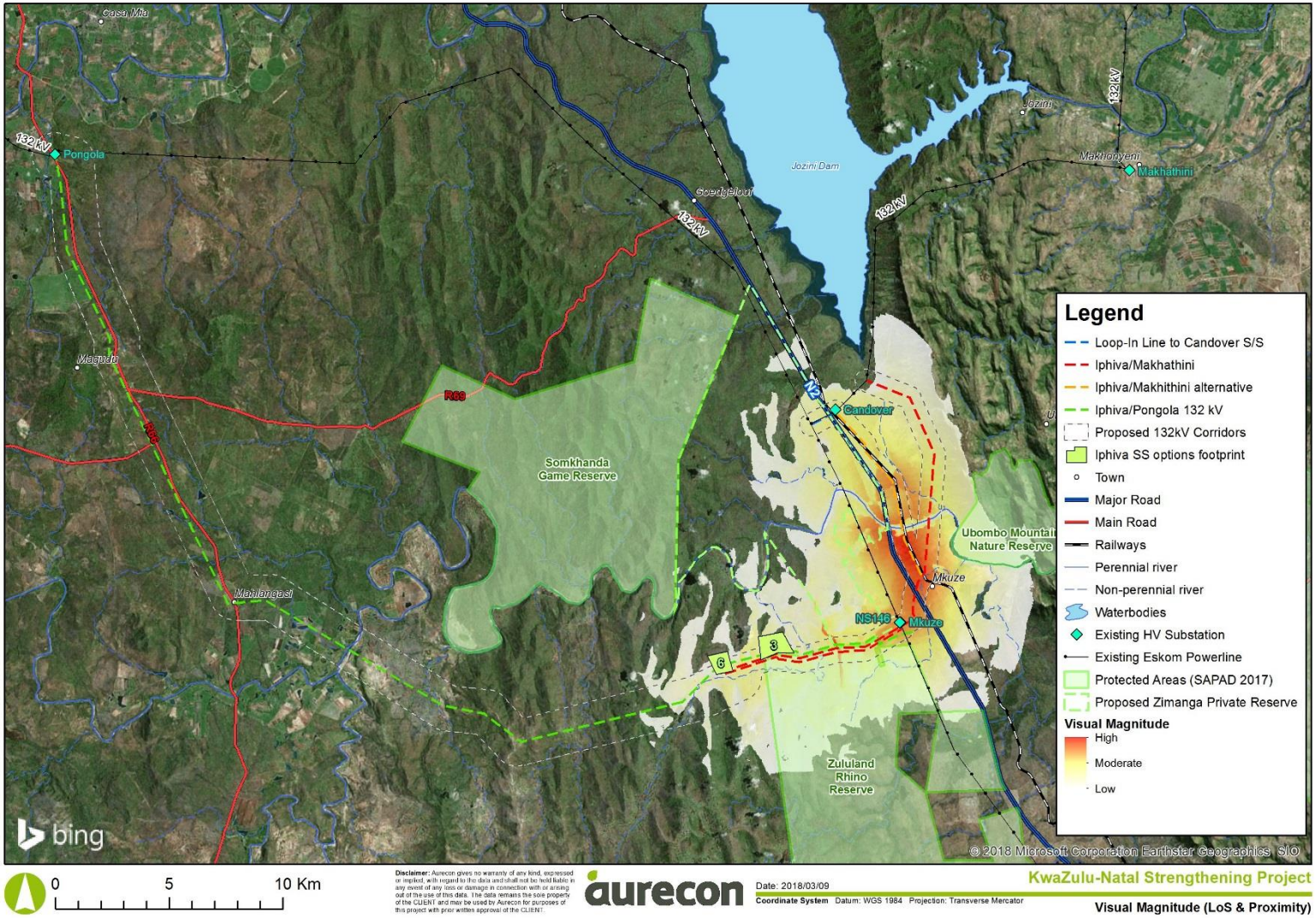

Figure 7-13: Viewshed of Iphiva / Makhathini / Mbazwane / Candover 132kV distribution powerline (WEST)

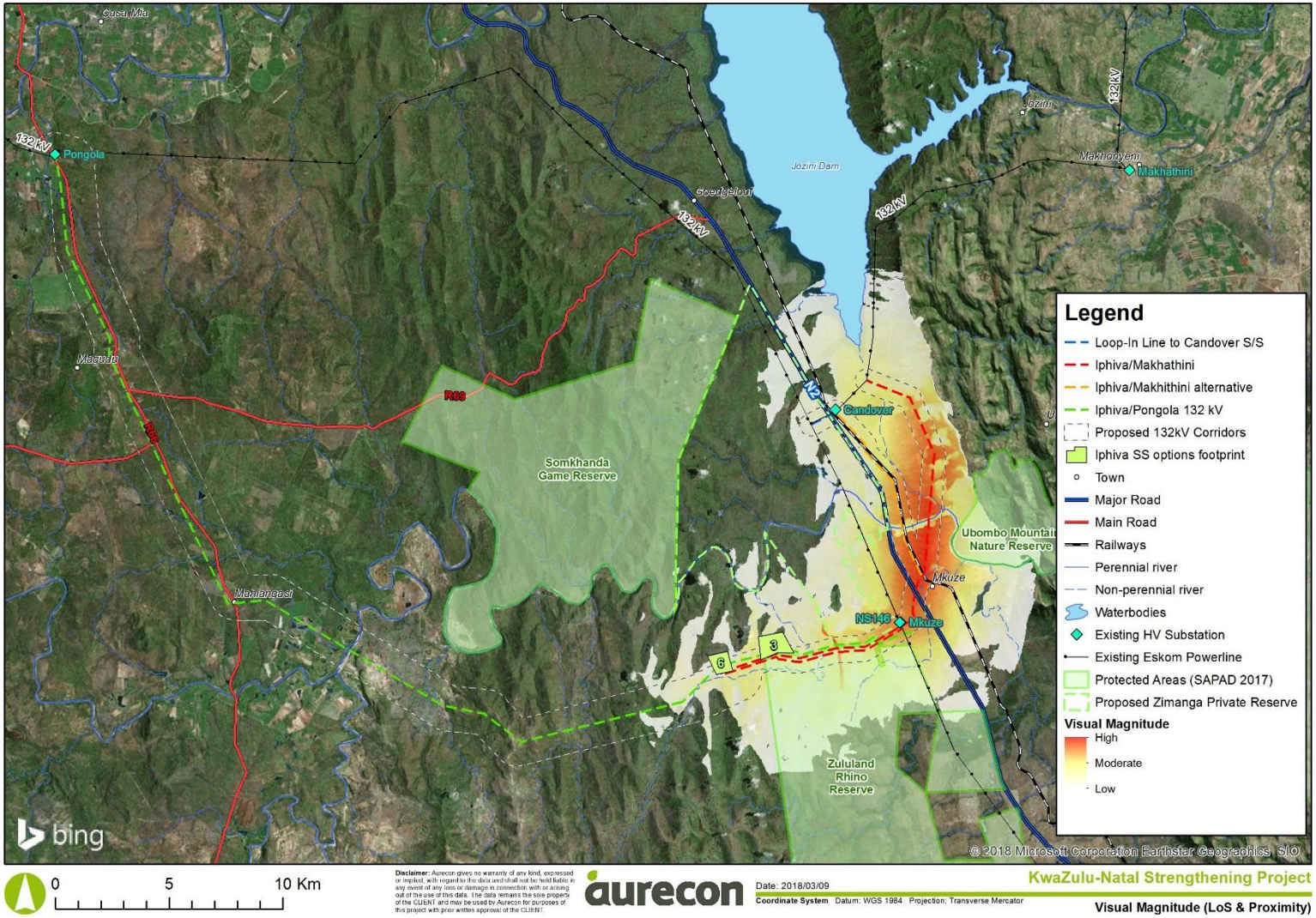

Figure 7-14: Viewshed of Iphiva / Makhathini / Mbazwane / Candover 132kV distribution powerline (EAST)

7.6.3 Preferred alternative

Between the two alternatives for Iphiva / Makhathini / Mbazwane / Candover, there is no clear preferred alternative from a visual perspective. However, the principle of consolidating visual impact along existing infrastructure corridors would favour the Western Alternative (for the section of powerline from Mkuze northwards).

7.7 Impact Assessment Tables

This section presents the combination of the various aspects of impacts, as presented in section 4.4, after assessment against the existing environment and viewshed maps generated above in Chapter 7.

Table 7-12: Impact ratings for Iphiva Substation

No:	Impact Description			Mitigation					
V-IS-1	Visual impact as a result of the Iphiva Substation on: > National / provincial road users (N2 / R33 / R69 / R66) > Formal settlements (such as Mkhuze) > Informal settlements / villages			**Avoid**					
				Minimise					
				Restore/ Rehabilitate					
				Compensate/ Offset					
	Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplaceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
	ISS 3								
	Without Mitigation	2	5	4	3	4	3	14	57
	With Mitigation	2	4	2	2	4	3	10	40
	ISS 6								
	Without Mitigation	2	5	4	3	3	3	14	42.5
	With Mitigation	2	4	2	2	3	3	10	30

No:	Impact Description			Mitigation					
V-IS-2	Visual impact as a result of the Iphiva Substation on: > Rural (commercial farming) homesteads			**Avoid**					
				Minimise					
				Restore/ Rehabilitate					
				Compensate/ Offset					
	Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplaceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
	ISS 3								
	Without Mitigation	1	5	3	4	3	3	13	40
	With Mitigation	1	4	3	3	2	3	11	22
	ISS 6								
	Without Mitigation	1	5	3	3	3	3	12	37
	With Mitigation	1	4	2	2	2	3	9	18

No:	Impact Description			Mitigation					
V-IS-3	Visual impact as a result of the Iphiva Substation on: > Protected areas: > Protected areas: Existing lodge locations in Rhino Reserve Complex (including Zululand Rhino, Thanda, Somkhanda			**Avoid**					
				Minimise					
				Restore/ Rehabilitate					
				Compensate/ Offset					
	Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
	ISS 3								
	Without Mitigation	2	5	4	5	4	3	16	65
	With Mitigation	2	4	3	4	4	3	13	52
	ISS 6								
	Without Mitigation	2	5	3	3	4	3	13	53
	With Mitigation	2	4	3	3	3	3	12	36

No:	Impact Description			Mitigation					
V-IS-4	Visual impact as a result of the night-time light of the Iphiva Substation on nearby Protected area receptors			**Avoid**					
				Minimise					
				Restore/ Rehabilitate					
				Compensate/ Offset					
	Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
	ISS 3								
	Without Mitigation	2	5	3	4	4	3	14	57
	With Mitigation	2	4	3	3	3	3	12	36
	ISS 6								
	Without Mitigation	2	5	3	3	3	3	13	40
	With Mitigation	2	4	2	2	2	3	10	20

Table 7-13: Impact ratings for Normandie-Iphiva 400 kV transmission powerline

No:	Impact Description			Mitigation					
V-NIT-1	Visual impact as a result of the Normandie-Iphiva 400 kV line on: > National / provincial road users (N2 / R33 / R69 / R66) > Formal settlements (such as Pongola / Mkhuze / Ulundi)			**Avoid**					
				Minimise					
				Restore/ Rehabilitate					
				Compensate/ Offset					
	Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
	N-I 2 (ABFGD)								
	Without Mitigation	3	5	3	3	3	3	14	41.75
	With Mitigation	2	4	3	2	2	3	11	22
	N-I 3 (AEFGD)								
	Without Mitigation	3	5	4	3	3	3	15	44
	With Mitigation	2	4	3	2	2	3	11	22

No:	Impact Description			Mitigation					
V-NIT-2	Visual impact as a result of the Normandie-Iphiva 400 kV line on: > Rural (commercial farming) homesteads			**Avoid**					
				Minimise					
				Restore/ Rehabilitate					
				Compensate/ Offset					
	Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
	N-I 2 (ABFGD)								
	Without Mitigation	3	5	3	4	5	3	15	75
	With Mitigation	2	4	3	3	3	3	12	36
	N-I 3 (AEFGD)								
	Without Mitigation	3	5	4	4	4	3	16	65
	With Mitigation	2	4	3	3	3	3	12	36

No:	Impact Description			Mitigation					
V-NIT-3	Visual impact as a result of the Normandie-Iphiva 400 kV line on: > Protected areas: Existing lodge locations in Rhino Reserve Complex (including Zululand Rhino, Thanda, Somkhanda and proposed Zimanga			**Avoid**					
				Minimise					
				Restore/ Rehabilitate					
				Compensate/ Offset					
	Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
	N-I 2 (ABFGD)								
	Without Mitigation	3	5	4	4	5	3	16	81
	With Mitigation	2	4	4	4	4	3	14	56
	N-I 3 (AEFGD)								
	Without Mitigation	3	5	4	4	5	3	16	81
	With Mitigation	2	4	4	4	4	3	14	56

No:	Impact Description			Mitigation					
V-NIT-4	Visual impact as a result of the Normandie-Iphiva 400 kV line on: > Protected areas: Private: Existing lodge locations in Ithala Reserve and Private Nature Reserves (such as Bendor, Welkom and Witbad Private Nature Reserves)			**Avoid**					
				Minimise					
				Restore/ Rehabilitate					
				Compensate/ Offset					
	Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
	N-I 2 (ABFGD)								
	Without Mitigation	2	5	3	1	1	1	10.5	10.5
	With Mitigation	2	4	3	1	1	1	10	10
	N-I 3 (AEFGD)								
	Without Mitigation	3	5	4	3	4	3	15	61
	With Mitigation	3	4	3	3	3	3	13	39

Table 7-14: Impact ratings for Iphiva-Duma 400 kV transmission powerline

No:	Impact Description			Mitigation					
V-IDT-1	Visual impact as a result of the Iphiva-Duma 400 kV line on: > National / provincial road users (N2 / R33 / R69 / R66) > Formal settlements (such as Pongola / Mkhuze / Ulundi) > Informal settlements / villages			**Avoid** **Minimise** **Restore/ Rehabilitate** **Compensate / Offset**					
	Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
	I-D WEST								
	Without Mitigation	3	5	3	3	3	3	14	43
	With Mitigation	2	4	3	2	2	3	11	22
	I-D EAST								
	Without Mitigation	3	5	3	3	3	3	14	43
	With Mitigation	2	4	3	2	2	3	11	22

No:	Impact Description			Mitigation					
V-IDT-2	Visual impact as a result of the Iphiva-Duma 400 kV line on: > Rural (commercial farming) homesteads			**Avoid** **Minimise** **Restore/ Rehabilitate** **Compensate / Offset**					
	Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
	I-D WEST								
	Without Mitigation	3	5	3	4	4	3	15	61
	With Mitigation	2	4	3	3	4	3	12	48
	I-D EAST								
	Without Mitigation	3	5	4	4	4	3	16	65
	With Mitigation	2	4	3	3	4	3	12	48

No:	Impact Description			Mitigation					
V-IDT-3	Visual impact as a result of the Iphiva-Duma 400 kV line on: > Protected areas: Existing lodge locations in Rhino Reserve Complex (including Zululand Rhino, Thanda, Somkhanda and proposed Zimanga Nature Reserves)			**Avoid** **Minimise** **Restore/ Rehabilitate** **Compensate / Offset**					
	Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplaceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
	I-D WEST								
	Without Mitigation	3	5	3	4	4	3	15	61
	With Mitigation	2	4	2	3	3	3	11	33
	I-D EAST								
	Without Mitigation	3	5	4	4	5	3	16	81
	With Mitigation	2	4	4	3	4	3	13	52

No:	Impact Description			Mitigation					
V-IDT-4	Visual impact as a result of the Iphiva-Duma 400 kV line on: > Protected areas: Existing lodge locations: Hluhluwe-Umfolozi Complex			**Avoid** **Minimise** **Restore/ Rehabilitate** **Compensate / Offset**					
	Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
	I-D WEST								
	Without Mitigation	3	5	3	4	3	3	15	46
	With Mitigation	2	4	3	3	3	3	12	36
	I-D EAST								
	Without Mitigation	3	5	4	4	4	3	16	65
	With Mitigation	2	4	3	3	3	3	12	36

Table 7-15: Impact ratings for 132 kV distribution powerlines

Impact Description: Visual Impact as a result of the various 132 kV distribution powerlines			Mitigation					
			Avoid					
			Minimise					
			Restore/ Rehabilitate					
			Compensate/ Offset					
Nature	**Extent**	**Duration**	**Intensity**	**Potential for Irreplceable loss**	**Probablility**	**Confidence**	**Consequence**	**Significance**
V-Dx-1: Iphiva-Pongola 132 kV powerline to tie into existing line, double circuit with Iphiva-Hluhluwe 132 kV powerline								
Without Mitigation	2	5	**4**	5	5	3	16	79
With Mitigation	2	4	3	4	4	3	13	52
V-Dx-2: Iphiva-Makhathini 132 kV powerline double circuit with Iphiva-Mbazwane 132 kV powerline								
WEST								
Without Mitigation	2	5	**3**	3	5	3	13	65
With Mitigation	2	4	3	2	4	3	11	44
EAST								
Without Mitigation	2	5	**4**	3	5	3	14	69
With Mitigation	2	4	3	2	4	3	11	44
V-Dx-3: Existing 132 kV powerline to the Candover Switching Station								
Without Mitigation	2	5	**3**	3	5	3	13	67
With Mitigation	2	4	3	2	4	3	11	44
V-Dx-4: Iphiva-Pongola 132 kV powerline								
Without Mitigation	2	5	**2**	3	5	3	12	60
With Mitigation	2	4	2	2	4	3	10	40

8. RECOMMENDED MITIGATION MEASURES

Environmental Impact Assessment Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended by Appendix 6 of GN 326 of 7 April 2017:

1. (1) A specialist report prepared in terms of these Regulations must contain—
   (k) any mitigation measures for inclusion in the EMPr;
   (l) any conditions for inclusion in the environmental authorisation;
   (m) any monitoring requirements for inclusion in the EMPr or environmental authorisation
   (n) (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.

Due to the nature of visual impacts, no visual impacts were identified for the *operational* and *rehabilitation phases* of the project, hence no visual mitigation measures are required in this section. *Construction phase* mitigation measures in this section include the *pre-construction phase*.

The potential visual impacts associated with transmission / distribution powerlines and associated infrastructure are related to alignment close to sensitive areas such as elevated ridges, koppies and wetlands that could be conserved as visual assets for tourist related activities. This was considered in the route selection process, where visual sensitivity was considered as a constraint to route alignment, thereby meeting the first step in the mitigation hierarchy, namely that of avoidance of the impact.
Visual impacts are best mitigated in the planning and design phase, and to a lesser extent the construction phase, both of which are tabled below.

<u>With regards the possibility of burying powerlines along the P-234:</u>
Although will reduce the visual impact, at the Integration meeting with the other specialists it was agreed that the overall impacts of burying the powerline are greater than the overall impacts of above-ground powerline. The impact ratings have therefore been done for above-ground powerlines.

8.1 Iphiva Substation Site

8.1.1 Mitigation and Monitoring Measures for Inclusion in the EMPr

Planning and Design Phase (Iphiva Substation)

Management Objective	Avoidance / minimisation of visual impact of the substation through planning and design	
Management Outcome	**Indicator**	**Targets**
• The substation should ideally be placed in the northern section of Site 6 (with the lowest visibility). The southern slopes of the hill on Site 6 should be avoided.	• Visibility from P234 / Protected areas	• Lowest visibility as determined by GIS viewshed
• The security lighting around the substation fence luminaire must be kept as low as possible. • Lighting should only come on when triggered by the non-lethal fence, and not remain on throughout the night. • Upwards light spill must be minimised by "blinkers" designed to ensure light is directed downwards whilst preventing side spill.	• Height of security lighting • Light switching • Upward and sideward light spill	• No higher than 4 m • No permanent night light • No light spill upwards or beyond site boundaries
• Locate construction camps outside of visually sensitive areas and away from critical view sources such as protected areas, rural homesteads; • Do not locate campsites in areas where it will be necessary to remove trees and shrubs or large areas of well-established vegetation; • Where possible make use of sites which have been previously disturbed	• Location of construction camps • Location of construction camps • Location of construction camps	• No construction camps visible from protected areas or rural homesteads • No construction camps in areas with established vegetation • No construction camps in undisturbed areas
Activities	Planning and design of substation	
Aspects	Resource use – land transformation	
Impacts and Risks		
Management Actions	**Responsible Person**	**Timeframe**
Design and placement of substation with reducing visual impact in mind	Design engineer / GIS Specialist	Detail design stage
Monitoring		
Method		**Frequency**

Note: *The communication mast will likely be placed on the hill for the line of sight principle, and its visibility can therefore not be mitigated.*

Construction Activities (Iphiva Substation)

Management Objective	Avoidance / minimisation of visual impact of the substation through construction activities and methods	
Management Outcome	**Indicator**	**Targets**
• Vegetation clearance around the construction footprint of the substation must be minimised by fencing off the work area and restricting vehicular access outside this area.	• Fencing	• Fencing in place at all times
• Make use of existing access roads where feasible, and keep new access roads at a minimum width requirement;	• Access roads	• No unnecessary new access roads
• Locate access roads so that it minimizes modification of the existing topography and the removal of large trees, roads should curve around natural features, mature trees and shrub thickets;	• Access roads	• Large trees and shrubs avoided
• Match the alignment and construction method of new access roads (i.e. stone in rocky areas etc.) to the topography and to the surrounding farm roads or tracks;	• Construction material	• Materials matched to area surrounds
• Locate new access roads away from visual assets such as wetlands, ridges and koppies;	• Access roads	• Avoidance of visual assets
• Access roads shall not cross over the crest of elevated landforms such as koppies and ridges and run parallel to and around the outline of the foot slopes.	• Access roads	• Avoidance of landform crests
• Material stockpiles must not be higher than 3m.	• Material stockpiles	• No higher than 3 m
Activities	Construction of substation and access roads	
Aspects	Resource use – land transformation	
Impacts and Risks		
Management Actions	**Responsible Person**	**Timeframe**
Construction of substation and access roads with reducing visual impact in mind	Contractor site manager	During construction
Monitoring		
Method		**Frequency**

8.1.2 Conditions to be included in the EA

None

8.2 Normandie-Iphiva 400 kV Powerline

8.2.1 Mitigation and Monitoring Measures for Inclusion in the EMPr

Planning and Design Phase (Normandie-Iphiva)

Management Objective	Avoidance / minimisation of visual impact of the powerline through planning and design	
Management Outcome	**Indicator**	**Targets**
• Due to its more visually intrusive footing design, self-supporting lattice towers such as the type 518 must only be used where guyed towers cannot be used (due to technical reasons)	• Tower type	• Self-supporting lattice towers only when structurally required (such as strain towers)
• Where the route crosses over several ridges, running parallel to the proposed route, the alignment should be located in the lower section so that the ridge lines forms a visual screen from both sides.	• Route alignment	• Towers placed in lower sections of ridge slopes
• The refined alignment should follow existing infrastructure corridors where the visual environment has already been compromised, and avoid visually sensitive areas and receptors where practical.	• Route alignment	• Alignment along infrastructure corridors, away from visually sensitive areas
• The security lighting around the contractor camps' fences must be kept as low as possible	• Height of security lighting	• No higher than 4 m
• Upwards light spill must be minimised by "blinkers" designed to ensure light is directed downwards whilst preventing side spill.	• Upward and sideward light spill	• No light spill upwards or beyond site boundaries
• Locate construction camps outside of visually sensitive areas and away from critical view sources such as protected areas, rural homesteads;	• Location of construction camps	• No construction camps visible from protected areas or rural homesteads
• Do not locate campsites in areas where it will be necessary to remove trees and shrubs or large areas of well-established vegetation;	• Location of construction camps	• No construction camps in areas with established vegetation
• Where possible make use of sites which have been previously disturbed	• Location of construction camps	• No construction camps in undisturbed areas (rather use disturbed areas)
Activities	Planning and design of powerline	
Aspects	Resource use – land transformation	
Impacts and Risks		
Management Actions	**Responsible Person**	**Timeframe**

Design and placement of transmission powerline alignment and pylon positions with reducing visual impact in mind	Design engineer / GIS Specialist	Detail design stage
Monitoring		
Method		**Frequency**

Construction Activities (Normandie-Iphiva)

Management Objective	Avoidance / minimisation of visual impact of the powerline through construction activities and methods	
Management Outcome	**Indicator**	**Targets**
• Vegetation clearance along the construction footprint of the servitude must be minimised by fencing off the work area and restricting vehicular access outside this area.	• Fencing	• Fencing in place at all times
• Make use of existing access roads where feasible, and keep new access roads at a minimum width requirement;	• Access roads	• No unnecessary new access roads
• Locate access roads so that it minimizes modification of the existing topography and the removal of large trees, roads should curve around natural features, mature trees and shrub thickets;	• Access roads	• Large trees and shrubs avoided
• Match the alignment and construction method of new access roads (i.e. stone in rocky areas etc.) to the topography and to the surrounding farm roads or tracks;	• Construction material • Access roads	• Materials matched to area surrounds
• Locate new access roads away from visual assets such as wetlands, ridges and koppies;	• Access roads	• Avoidance of visual assets
• Access roads shall not cross over the crest of elevated landforms such as koppies and ridges and run parallel to and around the outline of the foot slopes.	Material stockpiles	• Avoidance of landform crests
• Material stockpiles must not be higher than 3m.		• No higher than 3 m
Activities	Planning and design of powerline	
Aspects	Resource use – land transformation	
Impacts and Risks		
Management Actions	**Responsible Person**	**Timeframe**
Construction of powerline with reducing visual impact in mind	Contractor's site / project manager	Construction phase

Monitoring	
Method	**Frequency**

8.2.2 Conditions to be included in the EA

none

8.3 Iphiva-Duma 400 kV Powerline

8.3.1 Mitigation and Monitoring Measures for Inclusion in the EMPr

Planning and Design Phase (Iphiva-Duma)

Management Objective	Avoidance / minimisation of visual impact of the powerline through planning and design	
Management Outcome	**Indicator**	**Targets**
• Due to its more visually intrusive footing design, self-supporting lattice towers such as the type 518 must only be used where guyed towers cannot be used (due to technical reasons)	• Tower type	• Self-supporting lattice towers only when structurally required (such as strain towers)
• Where the route crosses over several ridges, running parallel to the proposed route, the alignment should be located in the lower section so that the ridge lines forms a visual screen from both sides.	• Route alignment	• Towers placed in lower sections of ridge slopes
• The refined alignment should follow existing infrastructure corridors where the visual environment has already been compromised, and avoid visually sensitive areas and receptors where practical.	• Route alignment	• Alignment along infrastructure corridors, away from visually sensitive areas
• The security lighting around the substation fence luminaire must be kept as low as possible. • Lighting should only come one when triggered by the non-lethal fence, and not remain on throughout the night. • Upwards light spill must be minimised by “blinkers” designed to ensure light is directed downwards whilst preventing side spill. • Locate construction camps outside of visually sensitive areas and away from critical view sources such as protected areas, rural homesteads;	• Height of security lighting • Light switching • Upward and sideward light spill • Location of construction camps	• No higher than 4 m • No permanent night light • No light spill upwards or beyond site boundaries • No construction camps visible from protected areas or rural homesteads • No construction camps in areas with established vegetation

• Do not locate campsites in areas where it will be necessary to remove trees and shrubs or large areas of well-established vegetation; • Where possible make use of sites which have been previously disturbed	• Location of construction camps • Location of construction camps	• No construction camps in undisturbed areas
Activities	Planning and design of 400 kV transmission powerline	
Aspects	Resource use – land transformation	
Impacts and Risks		
Management Actions	**Responsible Person**	**Timeframe**
Design and placement of powerline with reducing visual impact in mind	Design engineer / GIS Specialist	Detail design stage
Monitoring		
Method		**Frequency**

Construction Activities (Iphiva-Duma)

Management Objective	Avoidance / minimisation of visual impact of the powerline through construction activities and methods	
Management Outcome	**Indicator**	**Targets**
• Vegetation clearance along the construction footprint of the servitude must be minimised by fencing off the work area and restricting vehicular access outside this area.	• Fencing	• Fencing in place at all times
• Make use of existing access roads where feasible, and keep new access roads at a minimum width requirement;	• Access roads	• No unnecessary new access roads
• Locate access roads so that it minimizes modification of the existing topography and the removal of large trees, roads should curve around natural features, mature trees and shrub thickets;	• Access roads	• Large trees and shrubs avoided
• Match the alignment and construction method of new access roads (i.e. stone in rocky areas etc.) to the topography and to the surrounding farm roads or tracks;	• Construction material	• Materials matched to area surrounds
• Locate new access roads away from visual assets such as wetlands, ridges and koppies;	• Access roads • Access roads	• Avoidance of visual assets

• Access roads shall not cross over the crest of elevated landforms such as koppies and ridges and run parallel to and around the outline of the foot slopes. • Material stockpiles must not be higher than 3m.	• Material stockpiles	• Avoidance of landform crests • No higher than 3 m
Activities	Construction of 400 kV transmission powerline	
Aspects	Resource use – land transformation	
Impacts and Risks		
Management Actions	**Responsible Person**	**Timeframe**
Construction of powerline with reducing visual impact in mind	Contractor's site / project manager	Construction phase
Monitoring		
Method		**Frequency**

8.3.2 Conditions to be included in the EA

none

8.4 132 kV Distribution powerlines

8.4.1 Mitigation and Monitoring Measures for Inclusion in the EMPr

Planning and Design Phase (132 kV powerlines)

Management Objective	Avoidance / minimisation of visual impact of the powerline through planning and design	
Management Outcome	**Indicator**	**Targets**
• Due to its more visually intrusive footing design, lattice towers must only be used where guyed towers cannot be used (due to technical reasons)	• Tower type	• Self-supporting lattice towers only when structurally required (such as strain towers)
• Where the route crosses over several ridges, running parallel to the proposed route, the alignment should be located in the lower section so that the ridge lines forms a visual screen from both sides.	• Route alignment	• Towers placed in lower sections of ridge slopes
• The refined alignment should follow existing infrastructure	• Route alignment	• Alignment along infrastructure corridors,

corridors where the visual environment has already been compromised, and avoid visually sensitive areas and receptors where practical.		away from visually sensitive areas
• The security lighting around the construction camp fence luminaire must be kept as low as possible.	• Height of security lighting	• No higher than 4 m
• Upwards light spill must be minimised by "blinkers" designed to ensure light is directed downwards whilst preventing side spill.	• Upward and sideward light spill	• No light spill upwards or beyond site boundaries
• Locate construction camps outside of visually sensitive areas and away from critical view sources such as protected areas, rural homesteads;	• Location of construction camps	• No construction camps visible from protected areas or rural homesteads
• Do not locate campsites in areas where it will be necessary to remove trees and shrubs or large areas of well-established vegetation;	• Location of construction camps	• No construction camps in areas with established vegetation
• Where possible make use of sites which have been previously disturbed	• Location of construction camps	• No construction camps in undisturbed areas
Activities	Planning and design of powerline	
Aspects	Resource use – land transformation	
Impacts and Risks		
Management Actions	**Responsible Person**	**Timeframe**
Design and alignment of powerline with reducing visual impact in mind	Design engineer / GIS Specialist	Detail design stage
Monitoring		
Method		**Frequency**

Construction Activities (132 kV powerlines)

Management Objective	Avoidance / minimisation of visual impact of the powerline through construction activities and methods	
Management Outcome	**Indicator**	**Targets**

• Vegetation clearance along the construction footprint of the servitude must be minimised by fencing off the work area and restricting vehicular access outside this area.	• Fencing	• Fencing in place at all times
• Make use of existing access roads where feasible, and keep new access roads at a minimum width requirement;	• Access roads	• No unnecessary new access roads
• Locate access roads so that it minimizes modification of the existing topography and the removal of large trees, roads should curve around natural features, mature trees and shrub thickets;	• Access roads	• Large trees and shrubs avoided
• Match the alignment and construction method of new access roads (i.e. stone in rocky areas etc.) to the topography and to the surrounding farm roads or tracks;	• Construction material	• Materials matched to area surrounds
• Locate new access roads away from visual assets such as wetlands, ridges and koppies;	• Access roads	• Avoidance of visual assets
• Access roads shall not cross over the crest of elevated landforms such as koppies and ridges and run parallel to and around the outline of the foot slopes.	• Access roads	• Avoidance of landform crests
• Material stockpiles must not be higher than 3m.	• Material stockpiles	• No higher than 3 m
Activities	Construction of powerline	
Aspects	Resource use – land transformation	
Impacts and Risks		
Management Actions	**Responsible Person**	**Timeframe**
Construction of powerline with reducing visual impact in mind	Contractor's site / project manager	Detail design stage
Monitoring		
Method		**Frequency**

8.4.2 Conditions to be included in the EA

none

9. CONSULTATION PROCESS

Environmental Impact Assessment Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended by Appendix 6 of GN 326 of 7 April 2017:

1. (1) A specialist report prepared in terms of these Regulations must contain—
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report.

A summary of the public consultation process will be provided. Add any additional specific consultation here.

10. COMMENTS RECEIVED

Environmental Impact Assessment Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended by Appendix 6 of GN 326 of 7 April 2017:

1. (1) A specialist report prepared in terms of these Regulations must contain—
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto.

From Issues and Responses Report.

11. OTHER INFORMATION REQUESTED BY THE AUTHORITY

Environmental Impact Assessment Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended by Appendix 6 of GN 326 of 7 April 2017:

1. (1) A specialist report prepared in terms of these Regulations must contain—
(q) any other information requested by the competent authority.

There may be none.

12. CONCLUSION

Environmental Impact Assessment Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended by Appendix 6 of GN 326 of 7 April 2017:

1. (1) A specialist report prepared in terms of these Regulations must contain—

(n) a reasoned opinion—

(i) whether the proposed activity, activities or portions thereof should be authorised;

(ii) regarding the acceptability of the proposed activity or activities; and

12.1 Iphiva Substation

- It is recommended that the Site 6 alternative should be authorised.
- This is related to its lower visual sensitivity and impact when compared to Site 3, when considering the most sensitive viewer group, namely protected / conservation areas, followed by rural commercial farming homesteads.
- The remaining impact after mitigation is considered acceptable.

12.2 Normandie-Iphiva 400 kV Powerline

- It is recommended that the Normandie-Iphiva route Alternative 2 (along the N2) should be authorised. The widening of the corridor to the north (close to the start) is preferred, as it allows for the avoidance of visual impact on Mr De Waal's farm.
- This is related to its lower visual sensitivity and impact when compared to Alternative 3, when considering the most sensitive viewer group, namely protected / conservation areas, followed by rural commercial farming homesteads.
- The proposed deviations further south (on Normandie-Iphiva route Alternative 3) do not change the visual impact or mitigation potential and therefore do not affect the findings of the study.
- The remaining impact after mitigation is considered acceptable.

12.3 Iphiva-Duma 400 kV Powerline

- It is recommended that the Iphiva-Duma route Western Alternative (1 or 2) should be authorised.

- This is related to its lower visual sensitivity and impact when compared to the Eastern Alternative, when considering the most sensitive viewer group, namely protected / conservation areas, followed by rural commercial farming homesteads.
- The deviation close to Hluhluwe-Umfolozi is preferred, due to its greater distance from the boundary of the protected area, when compared to the original alignment. This lowers the potential visual impact on the particular protected area.
- The remaining impact after mitigation is considered acceptable.

12.4 132 kV Distribution Powerline

- It is recommended that the following components should be authorised:
  - Pongola/Iphiva (no alternative);
  - Iphiva/Hluhluwe (no alternative);
  - Candover HV to existing 132 kV powerline (no alternative).
- It is recommended that the Route alternative Iphiva/Makhathini/Mbazwane WEST should be authorised. This relates to the existing land use (mostly farming) and existing other infrastructure (rail and road), thereby consolidating visual impact along one corridor.
- The remaining impact after mitigation is considered acceptable.

13. REFERENCES

- Mucina, L and Rutherford MC. 2006. *The Vegetation of South Africa, Lesotho and Swaziland*. SANBI.
- Oberholzer, B. 2005. *Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F*. Republic of South Africa , Provincial government of the Western Cape, Department of environmental Affairs and Development Planning, Cape Town.

Appendix A: CVs of Specialist team

Appendix B: Declaration of Independence (as per DEA format)