Draft

Visual Impact Assessment

PROPOSED MUSINA MAKHADO SPECIAL ECONOMIC ZONE DEVELOPMENT

Newtown Landscape Architects

02 September 2019

MUSINA-MAKHADO SPECIAL ECONOMIC ZONE DEVELOPMENT

NORTHERN PROVINCE

Submitted to:

Delta Built Environment Consultants (Pty) Ltd

Rynlall Centre, Lynwood, 0180

Tel: +27 12 368 1850

www.deltabec.com

Prepared by:

Newtown Landscape Architects cc

369 Government Road, Johannesburg

www.newla.co.za

Report Revision No:	*DRAFT*
Date Issued:	02 Sept 2019
Prepared By:	Graham Young PrLArch, FILASA
Reviewed By:	Graham Young PrLArch, FILASA
Reference:	2410: Musina Makhado SEZ, Visual Impact Assessment

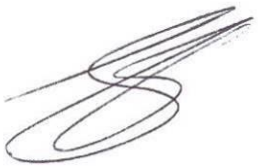
EXPERTISE OF SPECIALIST

Name:	Graham A Young
Qualification:	BL (Toronto)
Professional Registration:	South African Council for the Landscape Architectural Profession (SACLAP) Fellow Institute of Landscape Architects of South Africa (FILASA)
Experience in Years:	40 years
Experience	Graham is a landscape architect with forty years' experience. He has worked in Southern Africa and Canada and has valuable expertise in the practice of landscape architecture, urban design and environmental planning. He is also a senior lecturer, teaching urban design and landscape architecture at post and under graduate levels at the University of Pretoria. A specialty of his is Visual Impact Assessment for which he was cited with an ILASA Merit Award in 1999. He has completed over 275 specialist reports for projects in South Africa, Canada and other African countries. He was on the panel that developed the *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes* (2005) and produced a research document for Eskom, *The Visual Impacts of Power Lines* (2009). In 2011, he produced '*Guidelines for involving visual and aesthetic specialists'* for the Aapravasi Ghat Trust Fund Technical Committee (they manage a World Heritage Site) along with the *Visual Impact Assessment Training Module Guideline Document.*

DECLARATION OF INDEPENDENCE

I, Graham Young, declare that –

- I am contracted as the Visual Impact Assessment Specialist for Musina-Makhado SEZ Project;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act (Act 107 of 1998), 2014 Environmental Impact Assessment Regulations (as amended on 7 April 2017), and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I will consider, to the extent possible, the matters listed in Regulation 13;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing – any decision to be taken with respect to the application by the competent authority; and – the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 16 (1)(b)(iii).



Graham A. Young FILASA PrLArch Reg. No. 87001

02 September 2019

COPYRIGHT

PROTECTION OF PERSONAL INFORMATION ACT

In compliance with the Protection of Personal Information Act, No. 37067 of 26 November 2013, please ensure the following:

- Any personal information provided herein has been provided exclusively for use as part of the public participation registration process, and may therefore not be utilised for any purpose, other than that for which it was provided.
- No additional copies may be made of documents containing personal information unless permission has been obtained from the owner of said information.
- All documentation containing personal information must be destroyed, as soon as the purpose for which the information was collected has run out.

SPECIALIST REPORTING REQUIREMENTS

Specialist Reporting Requirements According to Appendix 6 of the National Environmental Management Act (Act 107 of 1998), Environmental Impact Assessment Regulation 2014 (as amended on 7 April 2017)	
Requirement	**Relevant section in report**
Details of the specialist who prepared the report	Page iii, Appendix E
The expertise of that person to compile a specialist report including a curriculum vitae	Page iii, Appendix E
A declaration that the person is independent in a form as may be specified by the competent authority	Page iv
An indication of the scope of, and the purpose for which, the report was prepared;	Section 1.3 – 1.4
An indication of the quality and age of base data used for the specialist report;	Section 3.2
A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7 & 13
The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1.4 and 3.2
A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3
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	Section 10
An identification of any areas to be avoided, including buffers	Section 11.1
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;	Figures 5, 5-1 and 6
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.5
A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Sections 10, 11 and 12
Any mitigation measures for inclusion in the EMPr;	Section 13
Any conditions for inclusion in the environmental authorisation	Section 13
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	N/A
A reasoned opinion whether the proposed activity, activities or	Section 14

portions thereof should be authorised regarding the acceptability of the proposed activity or activities; and	
If the opinion is that the proposed activity, or 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	Section 13
A description of any consultation process that was undertaken during the course of carrying out the study	Section 6
A summary and copies if any comments that were received during any consultation process	Section 6
Any other information requested by the competent authority.	No additional information was requested by the competent authority

ACRONYMS, ABBREVIATIONS & GLOSSARY

Acronyms & Abbreviations	
BAR	Basic Assessment Report
NLA	Newtown Landscape Architects
DTI	Department of Trade and Industry
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GYLA	Graham A Young Landscape Architect
SACLAP	South African Council for the Landscape Architectural Profession
SEZ	Special Economic Zone
VIA	Visual Impact Assessment
VAC	Visual Absorption Capacity
ZPI	Zone of Potential Influence

Glossary	
Aesthetic Value	Aesthetic value is the emotional response derived from the experience of the environment with its natural and cultural attributes. The response can be either to visual or non-visual elements and can embrace sound, smell and any other factor having a strong impact on human thoughts, feelings and attitudes (Ramsay, 1993). Thus, aesthetic value encompasses more than the seen view, visual quality or scenery, and includes atmosphere, landscape character and sense of place (Schapper, 1993).
Aesthetically significant place	A formally designated place visited by recreationists and others for the express purpose of enjoying its beauty. For example, tens of thousands of people visit Table Mountain on an annual basis. They come from around the country and even from around the world. By these measurements, one can make the case that Table Mountain (a designated National Park) is an aesthetic resource of national significance. Similarly, a resource that is visited by large numbers who come from across the region probably has regional significance. A place visited primarily by people whose place of origin is local is generally of local significance. Unvisited places either have no significance or are "no trespass" places. (after New York, Department of Environment 2000).
Aesthetic impact	Aesthetic impact occurs when there is a detrimental effect on the

	perceived beauty of a place or structure. Mere visibility, even startling visibility of a project proposal, should not be a threshold for decision making. Instead a project, by its visibility, must clearly interfere with or reduce (i.e. visual impact) the public's enjoyment and/or appreciation of the appearance of a valued resource e.g. cooling tower blocks a view from a National Park overlook (after New York, Department of Environment 2000).
Cumulative Effects	The summation of effects that result from changes caused by a development in conjunction with the other past, present or reasonably foreseeable actions.
Landscape Character	The individual elements that make up the landscape, including prominent or eye-catching features such as hills, valleys, woods, trees, water bodies, buildings and roads. They are generally quantifiable and can be easily described.
Landscape Impact	Landscape effects derive from changes in the physical landscape, which may give rise to changes in its character and how this is experienced (Institute of Environmental Assessment & The Landscape Institute, 1996).
Study area	For the purposes of this project the Study Area refers to the proposed project footprint / project site as well as the and area defined as a 30km the radius about the centre point of the project site beyond which the visual impact of the visible features will be insignificant.
Project Footprint / Site	For the purposes of this report the Project *site* / *footprint* refers to the actual layout of the project as described.
Sense of Place (genius loci)	Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. *A genius locus literally means* 'spirit of the place'.
Sensitive Receptors	Sensitivity of visual receptors (viewers) to a proposed development.
Viewshed analysis	The two-dimensional spatial pattern created by an analysis that defines areas, which contain all possible observation sites from which an object(s) would be visible. The basic assumption for preparing a viewshed analysis is that the observer eye height is 1,8m above ground level. The analysis represents the worst-case-scenario as only contours and not vegetation or other features on the landscape, are used to generate the model.
Visibility	The area from which project components would potentially be visible. Visibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation and distance.
Visual absorption capacity	Visual absorption capacity is defined as the landscape's ability to absorb physical changes without transformation in its visual character and

	quality. The landscape's ability to absorb change ranges from low capacity areas, in which the location of an activity is likely to cause visual change in the character of the area, to high capacity areas, in which the visual impact of development will be minimal (Amir & Gidalizon 1990).
Visual Exposure	Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion and visual acuity, which is also influenced by weather and light conditions.
Visual Impact	Visual effects relate to the changes that arise in the composition of available views because of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity.
Visual Intrusion	The nature of intrusion of an object on the visual quality of the environment resulting in its compatibility (absorbed into the landscape elements) or discord (contrasts with the landscape elements) with the landscape and surrounding land uses.
Worst-case Scenario	Principle applied where the environmental effects may vary, for example, seasonally to ensure the most severe potential effect is assessed.
Zone of Potential Visual Influence	By determining the zone of potential visual influence, it is possible to identify the extent of potential visibility and foreground and middleground views (up to 6,5km from the external boundary of the project site) which could be affected by the proposed development. Its maximum extent is the radius around an object beyond which the visual impact of its most visible features will reduce exponentially primarily due to distance.

EXECUTIVE SUMMARY

PROJECT OVERVIEW AND BACKGROUND

The Limpopo Provincial Government was requested by the Department of Trade and Industry (DTI) to identify strategic areas for the development of Limpopo's economy through industrialisation. Through a process of site selection and motivation the Musina-Makhado Special Economic Zone (SEZ) was identified. The Musina-Makhado SEZ comprises of two components situated at two different locations. The one site in Musina targets light industrial and agro-processing clusters, the other site (southern site) is 34 km from the northern site. It is a Greenfield site earmarked for the development of energy and a metallurgical cluster for the production of high-grade steel. The two developments will complement each other in terms of its respective product value chain and logistics. The essence of the Musina-Makhado SEZ is to create a new heavy industrial hub that forms part of the Trans-Limpopo Spatial Development Initiative. This report will focus only on the southern component of the Musina-Makhado SEZ (the Project) and will not address the northern component. There are no alternative sites proposed for the SEZ.

Newtown Landscape Architects (NLA) working through Delta Built Environment Consulting (Pty) Ltd (DeltaBEC) was commissioned by the Limpopo Economic Development Agency (LEDA) to carry out a visual impact assessment (VIA) of the Project. The VIA focuses on the physical aspects of the Project (form, scale and bulk), within its local context.

PROJECT SITE AND STUDY AREA

The project site is located on eight farms across the Makhado and Musina Local Municipalities, Vhemba District Municipality, Limpopo Province. The site is located approximately 30km north of Makhado and approximately 35km south of Musina. The study area comprises a visual envelope[1] of 30,0km around the site as indicated in Figure 1. It includes the site itself and the full extent of the wider landscape around it, which the proposed Project may influence. Beyond this distance the scale and bulk project components will recede dramatically into the background of views and be 'seldom seen', therefore having very little effect on visual impact. The areas of most visual concern are those from which project components would be viewed in the fore to middle ground of views (i.e. up to 8,0km from the edges of the Project boundary). The determination of the extent of the study area was therefore based on this information as well as observations during the site visit, and taking, topography, aspect, and existing vegetation into account.

[1] Distance Zones set as pre-determined distances from a viewpoint and help in delineating the extent of a study area. Although the full extent of the study area is also determined by the scale and bulk of the proposed activity. i.e. a powerline would recede into background views and smaller distances that say a 40m structure. Therefore, the extent of a study area is guided by these distance zones along with and understanding of the scale and bulk of the activity. In the Bureau of Land Management's (USA) visual resource management system, landscapes are subdivided into distanced zones based on relative visibility from travel routes or other observation points. The zones are foreground, middleground, background, and seldom seen. The foreground to middleground zone includes areas seen from viewing locations that are less than 5–8 km away. Seen areas beyond the foreground-middleground zone, are usually less than 24 km away in the background zone. Areas not seen as foreground-middleground or background (i.e., hidden from view) are in the seldom-seen zone (United States Department of the Interior. 2013). In the case of this project this distance is approximately 30km.

OBJECTIVE OF THE STUDY

The main aim of the study is to ensure that the visual/aesthetic consequences of the proposed Project are understood and adequately considered in the Environmental Impact Assessment (EIA) process in terms of Appendix 6 of the EIA Regulations 2014. Mitigation measures will be proposed, where appropriate.

TERMS OF REFERENCE

A specialist study is required to assess the potential visual impacts arising from the Project based on the general requirements for a comprehensive VIA and working to local and international best practice. The following terms of reference was established:

- Conduct a field survey of the proposed project area and photograph the area from sensitive viewing points (site visit was undertaken on the 14 and 15 March 2019);
- Describe the landscape character, quality and assess the visual resource of the study area;
- Describe the visual characteristics of the components of the project;
- Rate the significance of visual impact of the Project and its cumulative effects;
- Establish management measures for the project.
- Make a reasoned opinion whether the proposed activity, activities or portions thereof should be authorised regarding the acceptability of the proposed activity or activities.

ASSUMPTIONS AND LIMITATIONS

The following assumptions limitations have been made in the study:

- The description and layout of project components is limited to what has been supplied to the author prior to the date of completion of this report;
- The layout and height of the various structures and buildings is suggestive only, as the development and design of project components is fluid due to the continuing refinement of the project.
- The report has based its analysis and findings on a layout supplied by IX Engineers on the 26 August 2019.
- The 3D model of the project is based on this layout, the heights of the tallest buildings/structures supplied by the engineers and generic forms and heights derived from these data. The model therefore can only indicate the approximate location, scale and form of buildings and structures.
- The viewshed analyses are generated based on contours only, i.e. vegetation and structures where not taken into account. The result is that predicted visibility of project components is considered the worst-case scenario.
- At the time of the report, the findings of the public participation where limited to comments on the Scoping Report authored by Delta Built Environment Consultants.

ALTERNATIVES

There are currently no alternatives for the proposed Project.

FINDINGS

The existing visual condition of the landscape that may be affected by the proposed Project has been described. The study area's scenic quality has been rated *low* to *moderate* within the context of the sub-region and potential viewing areas and landscape types identified and mapped indicating potential sensitivity to the proposed development within a 30 km radius of the centre of the project site.

An overall visual resource rating within the context of the sub-region, of *low* to *high* is allocated to the study area. The lowest rating is associated with the existing mine located near Mopane and other power and rail infrastructure in the study area. A *high* rating is assigned to the Soutpansberg mountains located in the southern section of the study site, patches of Limpopo Ridge Bushveld and areas associated with the Sand River, which is located to the north of the Project site. A *moderate* rating is assigned to the Musina Mopane Bushveld which compromises the rest of the study area and most of the Project site.

Visual sensitivity towards the Project is expected to be high since the study area and project site are currently experienced as "natural" environments with very little man-made disturbances such as mining or industrial related activities. This is borne out when the public raised visual concerns during the Scoping phase (DeltaBEC February 2019), specifically as they relate to hunting and tourism activities.

In determining the visibility of the Project the proposed heights of project components were used to establish offsets equivalent to the proposed final heights of project components. These were used to generate viewsheds which indicate a high potential visibility for the Project. However, during the site investigation it became clear that existing tall vegetation and the flat to rolling topography, result in a high VAC landscape. The consequence being that most views to project activities would be blocked of partially blocked thus reducing significantly the intensity of visual impact on sensitive viewing areas. Only the very tall elements (i.e. the stacks), would protrude above the tree line.

The significance of the Project's visual impact (based on the worst-case scenario) during both the construction and operational phases is predicted to be *high* for localized areas to the north and west of the project site, as its physical presence will cause a major loss of or alteration to key landscape elements and visual characteristics of the baseline. Targets, limits and thresholds of concern are likely to be regularly exceeded and intervention is required.

Cumulative effect of the Project and Future Planned Projects

The proposed Musina-Makhado SEZ project will be constructed / developed in phases and as each phase is constructed it will contribute to the *negative* impact on the landscape aesthetics of the area. This will result in a cumulative impact that would be equivalent to the significance of impact for the worst-case scenario as described in Section 12.

Future cumulative effects will result from the mines and power project planned for the sub-region, many of which occur within the Project's study area. Refer to Figure 10. These projects are:

- Vele Project; is a proposed new mine located towards the north-west of Musina. The project falls outside the study area and is located approximately 30km from Musina.
- Generaal Project; is a proposed new coal mine located along the southern boundary of the Project site. The project stretches to the south and far east of the study area.
- Mopani Project; is a proposed new coal mine located along the north-western boundary of the Project site. The project stretches to the far north-west and west of the study area.
- Chapudi Project; is a proposed new coal mine located in the south-western corner of the study area.
- Makhado Project; is a proposed new coal mine located south and south-east of the Generaal Project.
- Mutsho Project; is a proposed new power plant located along the south-western boundary of the Project site.

Cumulative effects therefore arise from the intervisibility of the range of developments described above. The separate effects of these developments may not be of major significance in their own right, but together they may create an unacceptable degree of adverse effect on visual receptors within their combined visual envelopes. Intervisibility for these projects depends upon the study area's general topography, aspect and tree cover. The VAC for the study area is relatively high, but the combined effect over time would result in the entire study area being impacted upon in a significant manor. The potential result being a major lost and alteration to key elements and features of the visual resource baseline caused by the introduction of industrial and mining activities totally uncharacteristic with the pre-development landscape or view. High scenic quality impacts would result.

Mitigation

Mitigation is difficult due to the scale and bulk of Project activities. However, mitigation in both the construction and operational phases is possible, and can potentially reduce the impact from *high* (It must have an influence on the decision. Substantial mitigation will be required) to *moderate* (It should have an influence on the decision. Mitigation will be required). As the study area has a high VAC due to the nature of the vegetation and the relative flatness of the topography, mitigation must focus on retaining existing vegetation wherever possible and ensuring that structures are designed to blend with the natural landscape thus reducing the contrast between new structures and their natural surroundings. All vegetation not inside a development footprint must be retained, along with a 50m (minimum) buffer zone along the Project boundary.

Opinion of the author

The report's findings confirm that localized high visual impacts would occur for residents and other sensitive receptors, living in and visiting areas immediately north of the R525, west and south west of the project site. It is highly likely that the Project would compromise existing uses (primarily tourism and game farming) in the study area. Discussions should therefore be undertaken with local landowners who would be affected by the project. A small number of homesteads located on elevated ridgelines south of the site could experience open views of the project activities, which is of particular concern.

It is the opinion of the author that all aspects of the Project, from a potential visual impact perspective, should be approved provided that the mitigation/management measures are strictly adhered to and effectively implemented, managed and monitored in the long term.

****NLA****

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

1.1 Project Overview and Background

The Limpopo Provincial Government was requested by the Department of Trade and Industry (DTI) to identify strategic areas for the development of Limpopo's economy through industrialisation. Through a process of site selection and motivation the Musina-Makhado Special Economic Zone (SEZ) was identified. The Musina-Makhado SEZ comprises of two components situated at two different locations. The one site in Musina targets light industrial and agro-processing clusters, the other site (southern site) is 34 km from the northern site. It is a Greenfield site earmarked for the development of energy and a metallurgical cluster for the production of high-grade steel. The two developments will complement each other in terms of its respective product value chain and logistics. The essence of the Musina-Makhado SEZ is to create a new heavy industrial hub that forms part of the Trans-Limpopo Spatial Development Initiative. This report will focus only on the southern component of the Musina-Makhado SEZ (the Project) and will not address the northern component. There are no alternative sites proposed for the SEZ.

Newtown Landscape Architects (NLA) working through Delta Built Environment Consulting (Pty) Ltd (DeltaBEC) was commissioned by the Limpopo Economic Development Agency (LEDA) to carry out a visual impact assessment (VIA) of the Project. The VIA focuses on the physical aspects of the Project (form, scale and bulk), within its local context.

1.2 Project site and Proposed Study area

The project site is located on eight farms across the Makhado and Musina Local Municipalities, Vhemba District Municipality, Limpopo Province. The site is located approximately 30km north of Makhado and approximately 35km south of Musina. The study area comprises a visual envelope[2] of 30,0km around the site as indicated in Figure 1. It includes the site itself and the full extent of the wider landscape around it, which the proposed Project may influence. Beyond this distance the scale and bulk project components will recede dramatically into the background of views and be 'seldom seen', therefore having very little effect on visual impact. The areas of most visual concern are those from which project components would be viewed in the fore to middle ground of views (i.e. up to 8,0km from the edges of the Project boundary). The determination of the extent of the study area was therefore based on this information as well as observations during the site visit, and taking, topography, aspect, and existing vegetation into account.

1.3 Objective of the Specialist Study

The main aim of the study is to ensure that the visual/aesthetic consequences of the proposed Project are understood and adequately considered in the Environmental Impact Assessment (EIA) process in terms of Appendix 6 of the EIA Regulations 2014. Mitigation measures will be proposed, where appropriate.

[2] Distance Zones set as pre-determined distances from a viewpoint and help in delineating the extent of a study area. Although the full extent of the study area is also determined by the scale and bulk of the proposed activity. i.e. a powerline would recede into background views and smaller distances that say a 40m structure. Therefore, the extent of a study area is guided by these distance zones along with and understanding of the scale and bulk of the activity. In the Bureau of Land Management's (USA) visual resource management system, landscapes are subdivided into distanced zones based on relative visibility from travel routes or other observation points. The zones are foreground, middleground, background, and seldom seen. The foreground to middleground zone includes areas seen from viewing locations that are less than 5–8 km away. Seen areas beyond the foreground-middleground zone, are usually less than 24 km away in the background zone. Areas not seen as foreground-middleground or background (i.e., hidden from view) are in the seldom-seen zone (United States Department of the Interior. 2013). In the case of this project this distance is approximately 30km.

1.4 Terms and Reference

A specialist study is required to assess the potential visual impacts arising from the Project based on the general requirements for a comprehensive VIA and working to local and international best practice. The following terms of reference was established:

- Conduct a field survey of the proposed project area and photograph the area from sensitive viewing points (site visit was undertaken on the 14 and 15 March 2019);
- Describe the landscape character, quality and assess the visual resource of the study area;
- Describe the visual characteristics of the components of the project;
- Rate the significance of visual impact of the Project and its cumulative effects;
- Establish management measures for the project.
- Make a reasoned opinion whether the proposed activity, activities or portions thereof should be authorised regarding the acceptability of the proposed activity or activities.

1.5 Assumption, Uncertainties and Limitations

The following assumptions limitations have been made in the study:

- The description and layout of project components is limited to what has been supplied to the author prior to the date of completion of this report;
- The layout and height of the various structures and buildings is suggestive only, as the development and design of project components is fluid due to the continuing refinement of the project.
- The report has based its analysis and findings on a layout supplied by IX Engineers on the 26 August 2019.
- The 3D model of the project is based on this layout, the heights of the tallest buildings/structures supplied by the engineers and generic forms and heights derived from these data. The model therefore can only indicate the approximate location, scale and form of buildings and structures.
- The viewshed analyses are generated based on contours only, i.e. vegetation and structures where not taken into account. The result is that predicted visibility of project components is considered the worst-case scenario.
- At the time of the report, the findings of the public participation where limited to comments on the Scoping Report authored by Delta Built Environment Consultants.

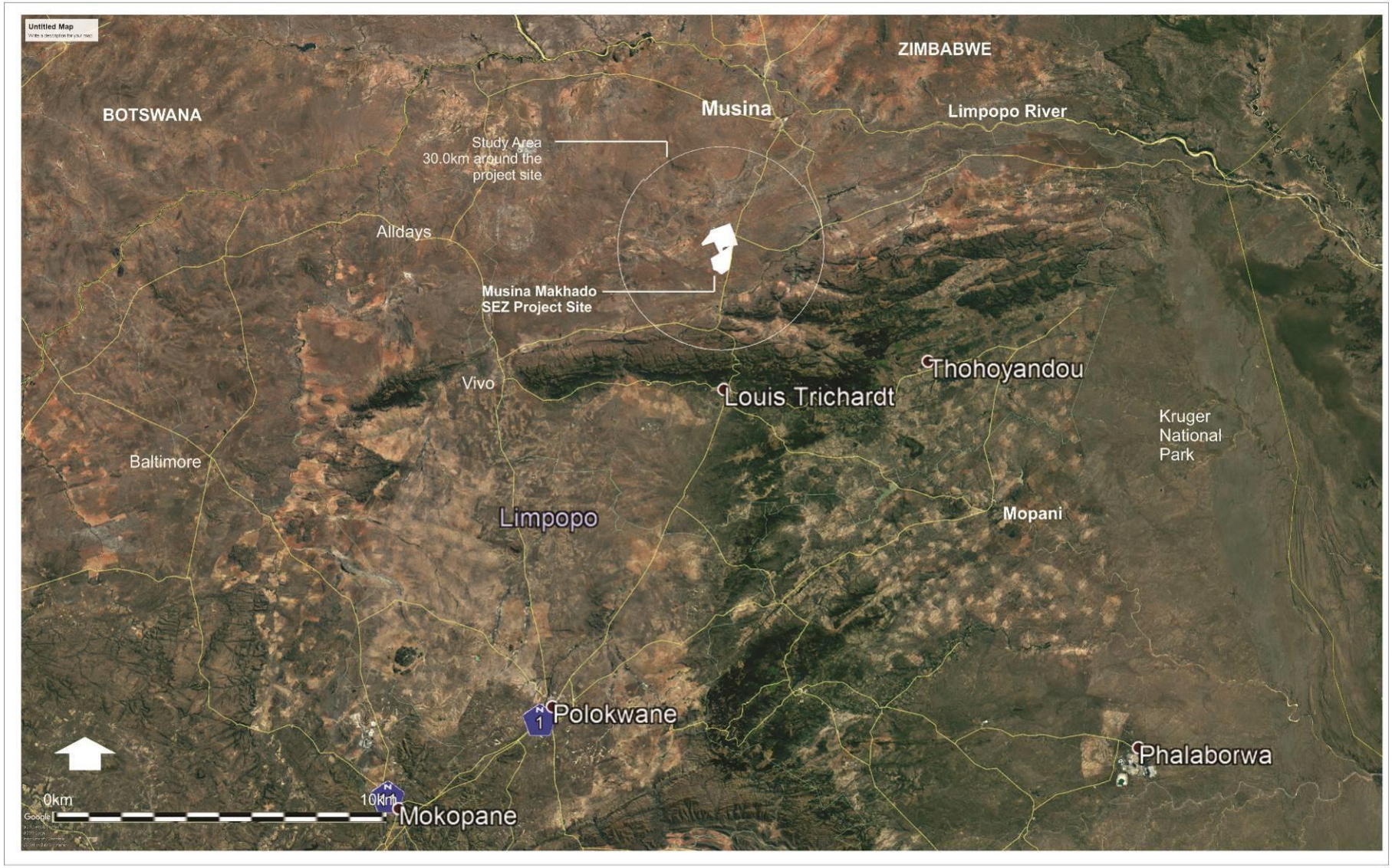


Figure 1: LOCALITY - Musina Makhado SEZ

2. LEGAL REQUIREMENTS AND GUIDELINES

This report adheres to the following legal requirements and guideline documents.

2.1 National Legislation and Guidelines

National Environmental Management Act (Act 107 of 1998), EIA Regulations

The specialist report is in accordance to the specification on conducting specialist studies as per Government Gazette (GN) R 982 of the National Environmental Management Act (NEMA) Act 107 of 1998. The mitigation measures as stipulated in the specialist report can be used as part of the Environmental Management Programme (EMPr) and will be in support of the Environmental Impact Assessment (EIA) and Appendix 6 of the EIA Regulations 2014, as amended on 7 April 2017.

The National Heritage Resources Act (25 of 1999)

The Act is applicable to the protection of heritage resources and includes the visual resources such as cultural landscapes, nature reserves, proclaimed scenic routes and urban conservation areas.

Western Cape Department of Environmental Affairs & Development Planning: Guideline for Involving Visual and Aesthetic Specialists in EIA Processes Edition 1 (CSIR, 2005)

Although the guidelines were specifically compiled for the Province of the Western Cape, they provide guidance that is appropriate for any EIA process. The Guideline document also seeks to clarify instances when a visual specialist should get involved in the EIA process.

2.2 International Guidelines

NLA work towards the standards as contained in the World Bank's IFC Performance Standards as highlighted below for mining operations but also appropriate to industrial development.

World Bank's IFC Standards

The World Bank's IFC Standards: Environmental, Health and Safety Guidelines for Mining refers to Visual Impact Assessments by stating that:

"Mining operations, and in particular surface mining activities, may result in negative visual impacts to resources associated with other landscape uses such as recreation or tourism. Potential contributors to visual impacts include high walls, erosion, discoloured water, haul roads, waste dumps, slurry ponds, abandoned mining equipment and structures, garbage and refuse dumps, open pits, and deforestation. Mining operations should prevent and minimize negative visual impacts through consultation with local communities about potential post-closure land use, incorporating visual impact assessment into the mine reclamation process. Reclaimed lands should, to the extent feasible, conform to the visual aspects of the surrounding landscape. The reclamation design and procedures should take into consideration the proximity to public viewpoints and the visual impact within the context of the viewing distance. Mitigation measures

may include strategic placement of screening materials including trees and use of appropriate plant species in the reclamation phase as well as modification in the placement of ancillary facilities and access roads."

The specialist study is in accordance to the IFC Performance Standards (Performance Standard 1 and 3: Social and Environmental Assessment and Management Systems) for the undertaking of Environmental Assessments and contributes to the EIA for the proposed Project.

3. APPROACH AND METHODOLOGY

3.1 Approach

The assessment of likely effects on a landscape resource and on visual amenity is complex, since it is determined through a combination of quantitative and qualitative evaluations. When assessing visual impact, the worst-case scenario is considered. Landscape and visual assessments are separate, although linked, procedures.

The landscape, its analysis and the assessment of impacts on the landscape all contribute to the baseline for visual impact assessment studies. The assessment of the potential impact on the landscape is carried out as an impact on an environmental resource, i.e. the physical landscape. Visual impacts, on the other hand, are assessed as one of the interrelated effects on people (i.e. the viewers and the impact of an introduced object into a view or scene).

3.1.1 The Visual Resource

Landscape character, landscape quality (Warnock & Brown 1998) and “sense of place” (Lynch 1992) are used to evaluate the visual resource i.e. the receiving environment. A qualitative evaluation of the landscape is essentially a subjective matter. In this study the aesthetic evaluation of the study area is determined by the professional opinion of the author based on site observations and the results of contemporary research in perceptual psychology.

Aesthetic value is the emotional response derived from the experience of the environment with its natural and cultural attributes. The response is usually to both visual and non-visual elements and can embrace sound, smell and any other factor having a strong impact on human thoughts, feelings and attitudes (Ramsay 1993). Thus, aesthetic value is more than the combined factors of the seen view, visual quality or scenery. It includes atmosphere, landscape character and sense of place (Schapper 1993). Refer also to Appendix B for further elaboration.

Studies for perceptual psychology have shown human preference for landscapes with higher visual complexity, for instance scenes with water or topographic interest. Based on contemporary research, landscape quality increases where:

- Topographic ruggedness and relative relief increase;
- Water forms are present;
- Diverse patterns of grassland and trees occur;
- Natural landscape increases and man-made landscape decreases;
- Where land use compatibility increases – there is not discord (Crawford 1994).

Aesthetic appeal (value) is therefore considered high when the following are present (Ramsay 1993):

- Abstract qualities: such as the presence of vivid, distinguished, uncommon or rare features or abstract attributes;

- Evocative responses: the ability of the landscape to evoke particularly strong responses in community members or visitors;
- Meanings: the existence of a long-standing special meaning to a group of people or the ability of the landscape to convey special meanings to viewers in general;
- Landmark quality: a feature that stands out and is recognized by the broader community.

And conversely, it would be low where:

- Limited patterns of grasslands and trees occur;
- Natural landscape decreases and man-made landscape increases;
- And where land use compatibility decreases – there is discord (Crawford 1994).

In determining the quality of the visual resource for the Project site, both the objective and the subjective or aesthetic factors associated with the landscape are considered. Many landscapes can be said to have a keen sense of place, regardless of whether they are scenically beautiful. However, where landscape quality, aesthetic value and a powerful sense of place coincide, the visual resource or perceived value of the landscape is very high. The criteria given in Appendix B are used to assess landscape quality, sense of place and ultimately to determine the aesthetic value of the study area.

3.1.2 Sensitivity of Visual Resource

The sensitivity of a landscape or visual resource is the degree to which a landscape type or area can accommodate change arising from a development, without detrimental effects on its character i.e. a high visual absorption capacity. Its determination is based upon an evaluation of each key elements or characteristics of the landscape likely to be affected. The evaluation will reflect such factors as its “quality, value, contribution to landscape character, and the degree to which the particular element or characteristic can be replaced or substituted” (Institute of Environmental Assessment & The Landscape Institute 1996:87).

3.1.3 Sense of Place

Central to the concept of sense of place is that the landscape requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area. According to Lynch (1992), sense of place is the extent to which a person can recognize or recall a place as being distinct from other places – as having a vivid, unique, or at least particular, character of its own. Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. In some cases, the values allocated to the place are similar for a wide spectrum of users or viewers, giving the place a universally recognized and therefore, strong sense of place.

The study area’s sense of place is derived from the emotional, aesthetic and visual response to the environment, and therefore it cannot be experienced in isolation i.e. the landscape context must be considered. The combination of the natural landscape together with the manmade structures / activities contribute to the sense of place for the study area. It is this combination that define the study area, and which establish its visual and aesthetic identity.

3.1.4 Sensitive Viewer Locations

The sensitivity of visual receptors and views are dependent on the location and context of the viewpoint, the expectations and occupation or activity of the receptor or the importance of the view, which may be determined with respect to its popularity or numbers of people affected, its appearance in guidebooks, on tourist maps, and in the facilities provided for its enjoyment and references to it in literature or art.

Typically, sensitive receptors may include:

- Users of all outdoor tourist and recreational facilities including public rights of way, whose intention or interest may be focused on the landscape;
- Communities where development results in negative changes in the landscape setting or valued views enjoyed by the community;
- Occupiers of residential properties / homesteads with views negatively affected by the development.

Views from residences and tourist facilities/routes are typically the most sensitive, since they are frequent and of long duration.

Other, less sensitive, receptors include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value);
- People traveling through or past the affected landscape in cars or other transport modes;
- People at their place of work.

For a detailed description of the methodology to determine the value of a visual resource, refer to Appendix A. Image 1 below, graphically illustrates the visual impact process used to determine the significance of visual impact of the Project.

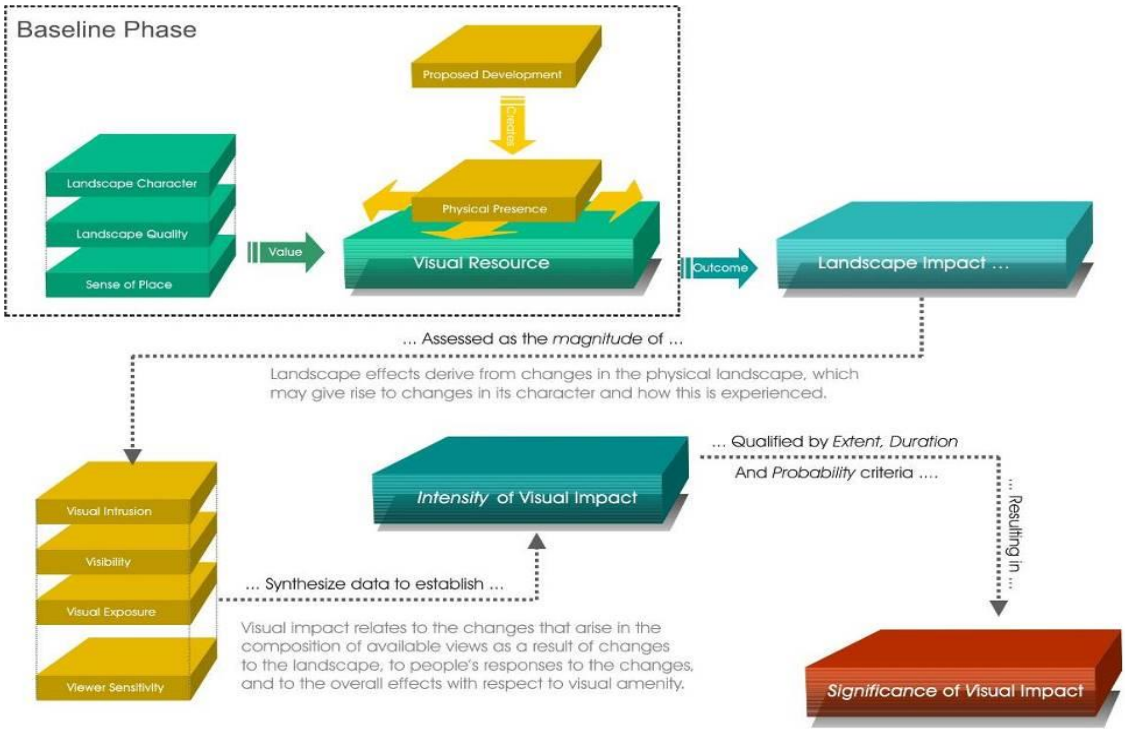


Image 1: Visual Impact Process

3.1.5 Landscape Impact

The landscape impact of a proposed development is measured as the change to the fabric, character and quality of the landscape caused by the physical presence of the proposed development. Identifying and describing the nature and intensity (magnitude) of change in the landscape brought about by the proposed Project is based on the method describe in this section, the professional opinion of the author and supported by computer modelling and photographic simulations. It is imperative to depict the change to the landscape in as realistic a manner as possible (Van Dortmont in Lange, 1994). In order to do this, photographic panoramas were taken from four key viewpoints about the site and altered using computer simulation techniques to illustrate the physical nature of the proposed project in its final form within the context of the landscape setting. The resultant change to the landscape is then observable and an assessment of the anticipated visual intrusion can be made.

3.1.6 Visual Impact

Visual impacts are a subset of landscape impacts. Visual impacts relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effect with respect to visual amenity. Visual impact is therefore measured as the change to the existing visual environment (i.e. views) caused by the intervention and the extent to which that change compromises (negative impact) or enhances (positive impact) or maintains the visual quality of the scene as perceived by people visiting, working or living in the area. This approach reflects the layman's concerns, which normally are:

- Will I be able to see the new development?
- What will it look like?

- Will the development affect views in the area and if so how?

Landscape and visual impacts do not necessarily coincide. Landscape impacts can occur with the absence of visual impacts, for instance where a development is wholly screened from available public views, but nonetheless results in a loss of landscape elements and landscape character within a localized area (the site and its immediate surrounds).

3.1.7 Intensity of Visual Impact

The intensity of visual impact is determined using visual intrusion, visibility and visual exposure criteria (Hull, R.B. and Bishop, I.E., 1988), qualified by the sensitivity of viewers (visual receptors) towards the proposed Project. The intensity of visual impact is therefore concerned with:

- The overall impact on the visual amenity, which can range from degradation through to enhancement;
- The direct impacts of the Project upon views of the landscape through intrusion or obstruction;
- The reactions of viewers who may be affected.

3.1.8 Significance of Visual Impact

A combined quantitative and qualitative methodology was used to describe the significance of potential visual impacts using spatial scale, temporal scale, probability and degree of certainty, criteria. A summary of each of the qualitative descriptions along with the equivalent quantitative rating scale is presented in Annexure D.

3.2 Methodology

The following method was used for the Project:

- Site visit: A field survey was undertaken, and the study area scrutinized to the extent that the receiving environment could be documented and adequately described. The site visit took place on the 14 and 15 March 2019.
- Project components: The physical characteristics of the project components were described and illustrated using a basic 3D modelling technique and ‘artistic’ impressions supplied by the Client;
- General landscape characterization: The visual resource (i.e. receiving environment) was mapped using field survey and GIS mapping technology. The description of the landscape focused on the nature of the land rather than the response of a viewer (refer to Appendix A);
- The quality of the landscape was described. Aesthetic appeal was described using recognized contemporary research in perceptual psychology as the basis;
- The sense of place of the study area was described as to the uniqueness and distinctiveness of the landscape. The primary informant of these qualities was the spatial form and character of the natural landscape together with the cultural transformations associated with the historic / current use of the land;

- Illustrations, in very basic simulations, of the proposed project were overlaid onto Google Earth and panoramas of the landscape, as seen from nearby sensitive viewing points to give the reviewer an idea of the scale and location of the proposed project within their landscape context;
- Visual intrusion (contrast) of the proposed project was determined by simulating its physical appearance from sensitive viewing areas;
- The visibility of the proposed project was determined using a viewshed analysis generated in a GIS programme;
- The impact on the visual environment and sense of place of the proposed project was rated based on a professional opinion and the method described below;
- Cumulative impact is discussed; and
- Measures that could mitigate negative impacts of the Project were recommended.

4. DESCRIPTION OF THE PROJECT

Figure 2 is an indicative layout of the Project's various components. Figure 2-1 is an aerial view of an 'artist's expression' of the project components. These illustrations are merely examples of what the different components could look like and are not based on the layout illustrated in Figure 2.

The Project will compromise a variety of activities and infrastructure that ensure the optimal manufacturing operations in the SEZ. Project components have been divided into the energy and metallurgical complex and the ancillary components, which are the infrastructure required for the energy and metallurgical activities. This report focusses on these components, as per the layout provided and does not include any additional facilities that might be required as a result of the Musina – Makhado SEZ.

4.1 Energy and Metallurgic Components

It is envisaged that the energy and metallurgical complex will comprise the manufacturing plants outlined in Table 1 below along with the approximate height of the structures:

Table 1: Heights of Buildings and Stacks[3]

No.	Project	Maximum height (m)	
		Plant	Stacks
1	Thermal power plant	80	210
2	Coal washery	15	N/A
3	Coke plant	25	80
	Heat recovery power generation	25	N/A
4	High Vanadium Steel plant	25	38
5	High Manganese steel	25	38
6	Ferromanganese plant	25	38
7	Silicon manganese plant	25	38
8	Domestic Waste Site	13	N/A
9	Cement Plant	32	38
10	Refractories factory	13	N/A

[3] iX Engineers (Pty) Ltd, *EMSEZ – Internal Master Planning Extract of Land Use & Infrastructure, 08 August 2019*

11	Stainless steel plant	25	38
12	Ferrochrome plant	25	38
13	Lime plant	15	N/A
14	Vanadium-titanium magnetite project	25	38
15	SEZ administrative center	13	N/A
16	Logistics center	13	N/A
17	Bonded area	13	N/A
18	Machinery zone	18	N/A
19	Processing zone	25	N/A
20	Sewage treatment plant	10	N/A
21	Industrial & domestic water plant	10	N/A
22	Environmental Conservation Area	N/A	N/A
23	Fuel storage	13	N/A
24	Gas Storage	13	N/A
25	Water Reservoir	21	N/A
26	Eco Village changed to Visitors lodge	13	N/A

4.2 Ancillary Components

The ancillary components will include:

- Infrastructure;
- Shopping Centres;
- Businesses / Office Space;
- Residential
- Recreational facilities including a visitors' guest lodge;
- Administrative centre;
- Educational facilities;
- Places of Worship.

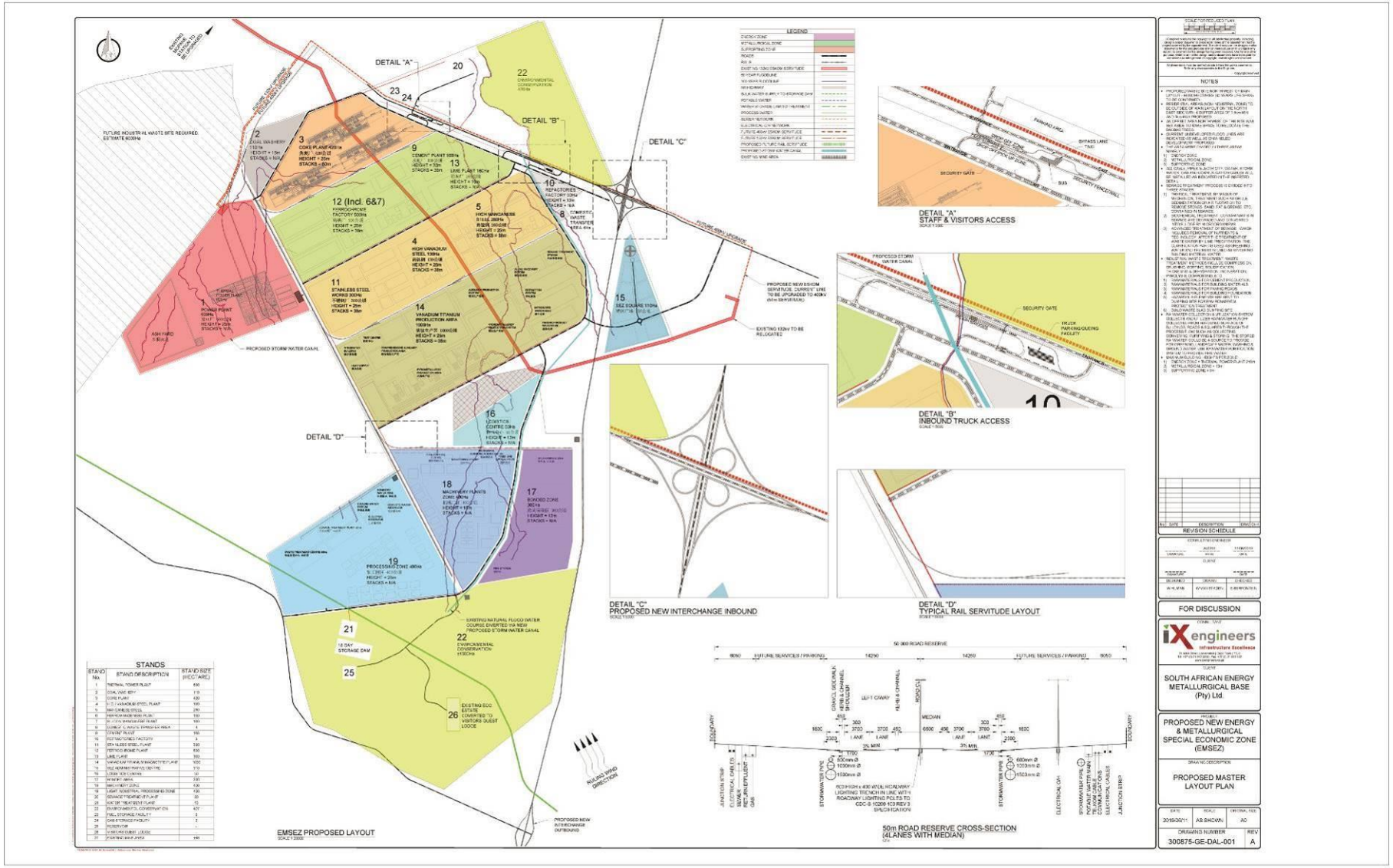


Figure 2: LAYOUT - Musina Makhado SEZ

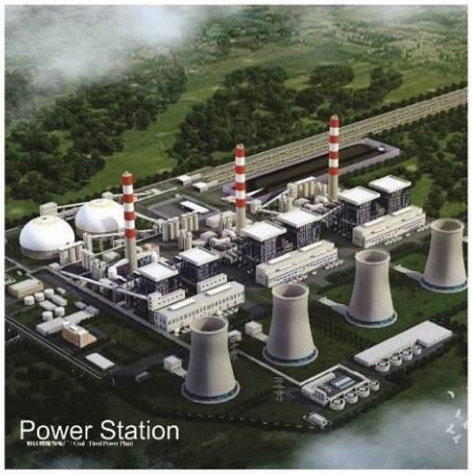


Figure 2-1: LAYOUT - AERIAL PERSPECTIVES - Musina Makhado SEZ

5. PROJECT ALTERNATIVES

The only alternative that was identified in the Scoping Report (Delta Built Environment Consultants 2019) is the option of different layouts within the proposed project site boundary. These alternatives were based on the topography and sensitive ecological areas and the results of the findings of the various specialist. There are therefore currently no alternatives that were considered for the proposed Project.

6. VISUAL ISSUES

Typical issues associated with industrial projects:

- Who will be able to see the development?
- What will it look like and will it contrast with the receiving environment?
- Will the development affect sensitive views in the area and if so how?
- What will be the impact of the development during the day and at night?
- What will the cumulative impact be?

During the public participation process that was conducted by Delta Built Environment Consultants (Pty) Ltd, most of the concerns that were received from the public related to the impact the project will have on tourism and hunting (game farms) in the area. These concerns, as well as the visual issues, as stated above, will be discussed in the following sections.

7. THE ENVIRONMENTAL SETTING

7.1 General Landscape Character

The regional landscape is characterized by bushveld on rolling topography with the Soutpansberg, to the south of the site, providing a dramatic feature to the study area. A series of ridges traverse the site from west to east and the Sand River flows to the north east of the site eventually flowing into the Limpopo River. The study area comprises Limpopo Ridge Bushveld, Musina Mopane Bushveld and the Soutpansberg Mountain Bushveld (Mucina and Rutherford 2006), on undulating to very irregular plains, with some hills and ridges in the central section, and the Soutpansberg Mountain in the south. However, the bulk of the study area and the Project site is Musina Mopane Bushveld. Only small portions of the northern extreme and in the south associated with a ridgeline, is Limpopo Ridge Bushveld (refer to Figure 5). The vegetation is mostly a combination of moderately open savanna with poorly developed ground layer and open woodland to denser shrub veld.

According to Mucina and Rutherford (2006) the Soutpansberg Mountain Bushveld is 'vulnerable' whereas the Musina Mopane and Limpopo Ridge Bushveld is 'least threatened'. The combination of vegetation types within makes the area ideal for hunting and tourism. The two main activities of the sub-region. The nature and character of this landscape is illustrated in panoramas contained in Figures 4-1 to 4-11. Figure 3 indicates the location of the panoramas on an aerial photograph.

7.1.1 Mining

There are currently no active mines located within the Project site. There is, however, evidence of an old historic mine located on the farm Steenbok 565 MS and the Syferfontein Mine is located on the northern boundary of the site, immediately south of Mopane.

7.1.2 Farmsteads/ Residential

There are a many homesteads and farmsteads spread throughout the study area but most residents are located in the towns surrounding the study area, Musina, located to the north, Makhado, to the south and Waterpoort to the south west. There are also a number of settlements located in the far south eastern sector of the study area, Mudimeli, Thikuwe, Matsa and Maangani. However, all of these settlements will not be able to see Project activities due to the mountainous terrain in their vicinity. Refer to Figure 6

7.1.3 Infrastructure and roads

The main roads in the study area are the N1 that borders the eastern boundary of the Project site and is routed in a south to north direction connecting Makhado and Musina. The R525 runs east west past the northern boundary of the site and the R523 passes through the extreme southern section of the study area. All these roads are considered tourist roads as they connect to the study area (a tourist destination) with other tourist areas associated with the Soutpansberg (south) and the Limpopo Valley (north) and Tshipise and the Kruger National Park east of the study area. Refer to Figure 6.

A railway line runs south to north through Mopane and along a section of the western boundary of the

Project site.

A power line runs parallel to the N1 from Makhado to Musina. There is also a power line connecting between Mopane to Musina.

7.1.4 Tourism

There are numerous game farms, nature reserves and private nature reserves located throughout and near the study area. These include the Baobab Private Nature Reserve located to the north of the project site, Avarel Private Nature Reserve located to the north-east of the project site, Nzhelele Private Nature Reserve and Honnet Nature Reserve located to the east of the project site. There are also several nature reserves surrounding the study area, namely; Dongolo Belvedere Private Nature Reserve, Balaai Private Nature Reserve, Musina Nature Reserve, Motevel Private Nature Reserve, Bergsig Private Nature Reserve. Chapudi Private Nature Reserve, Johanna F. Uys Private Nature Reserve and the Mapungubwe Cultural Landscape Buffer located to the north-east of the study area. Refer to Figure 6.

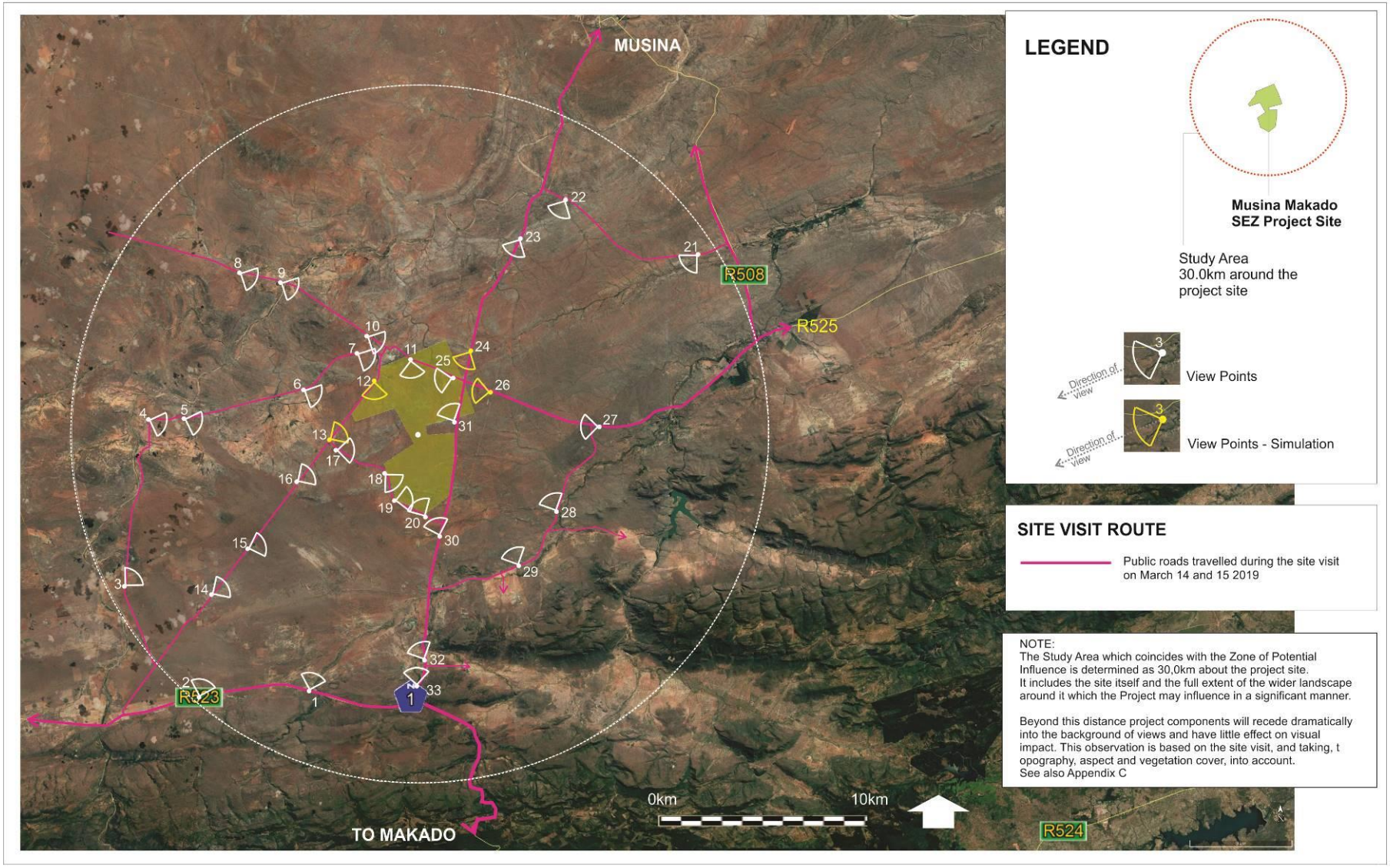


Figure 3: VIEWS AND VISUAL RECEPTORS - Musina Makhado SEZ

Figure 04-1: LANDSCAPE CHARACTER - Views 1, 2 and 3

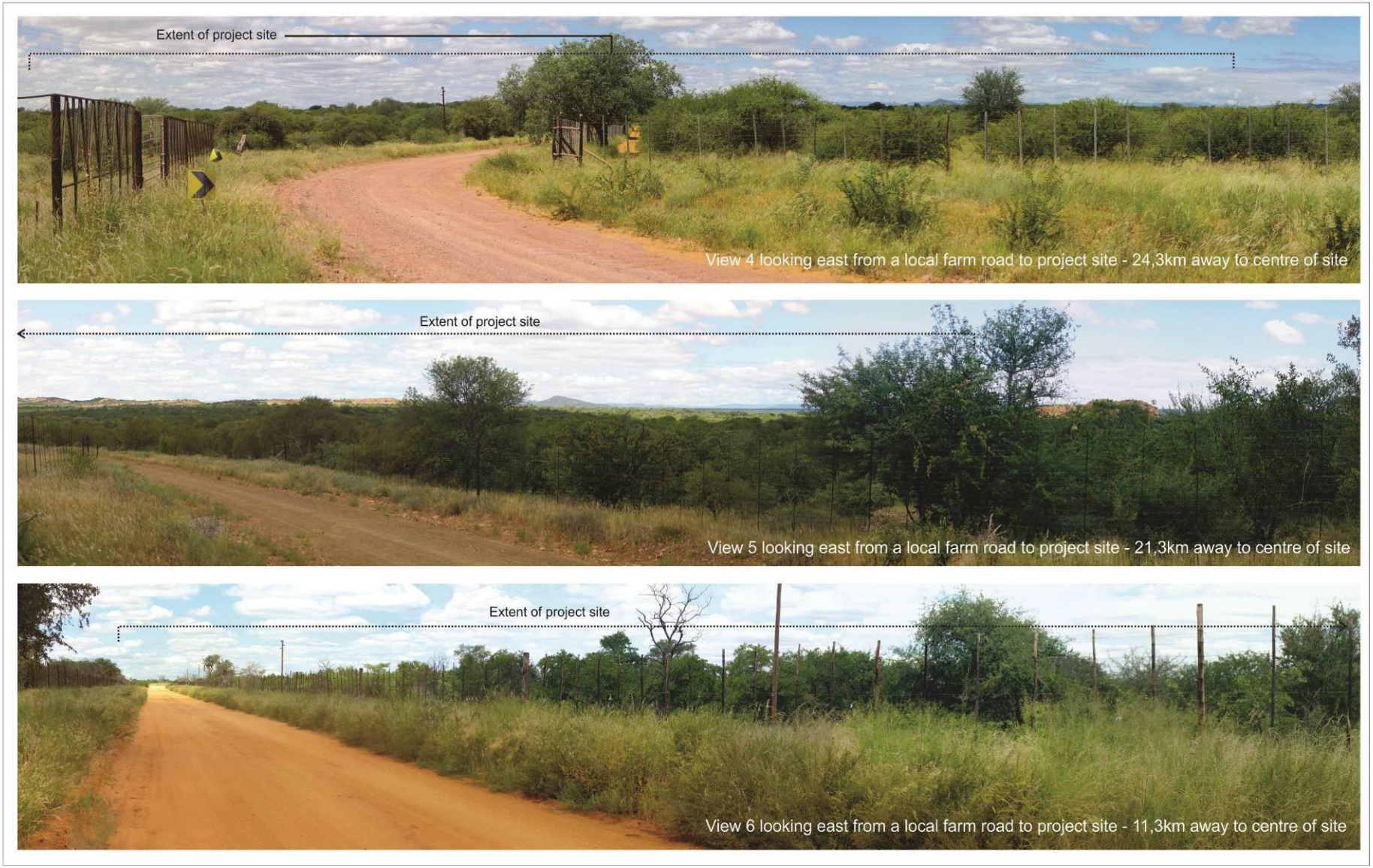


Figure 04-2: LANDSCAPE CHARACTER - Views 4, 5 and 6

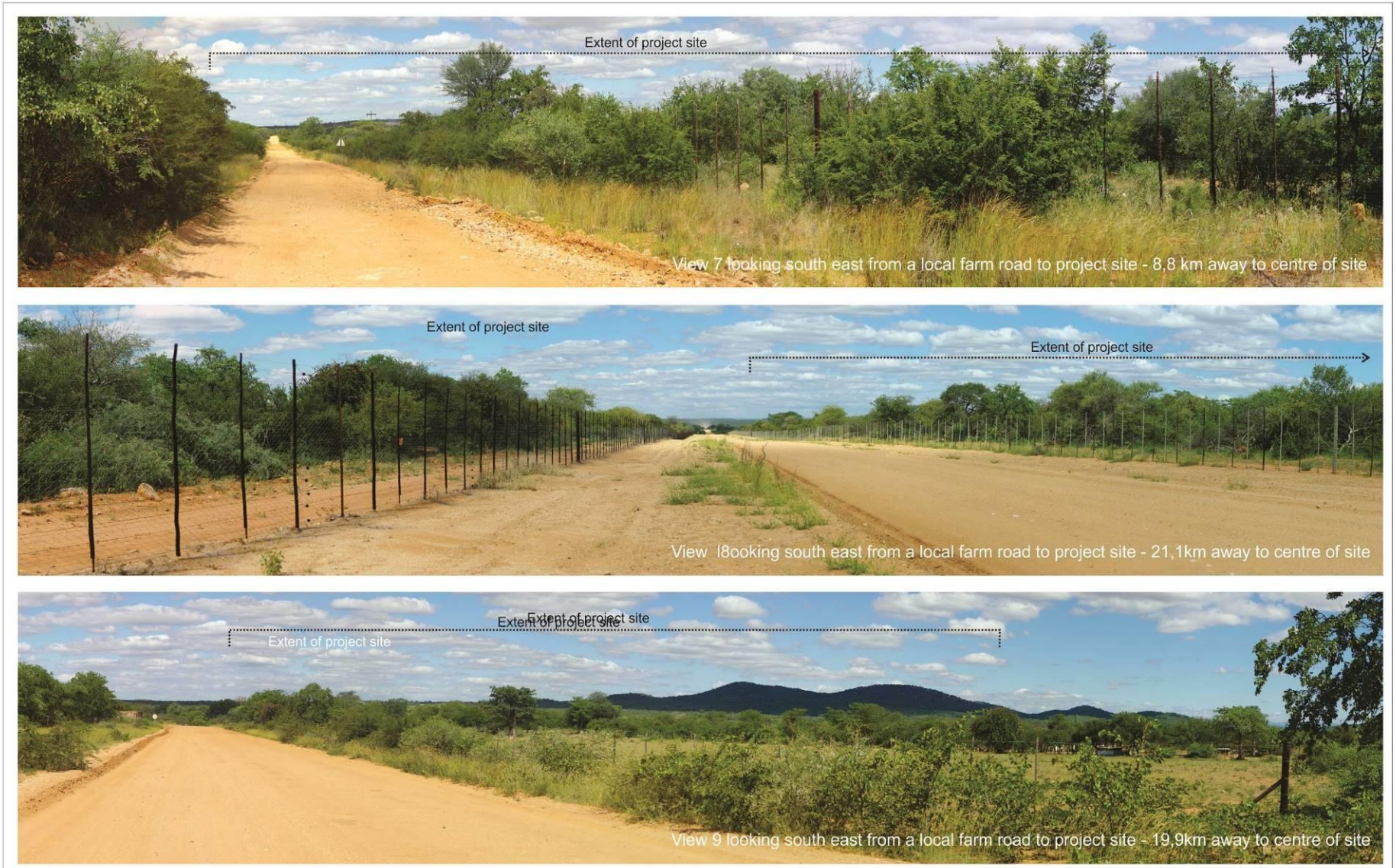
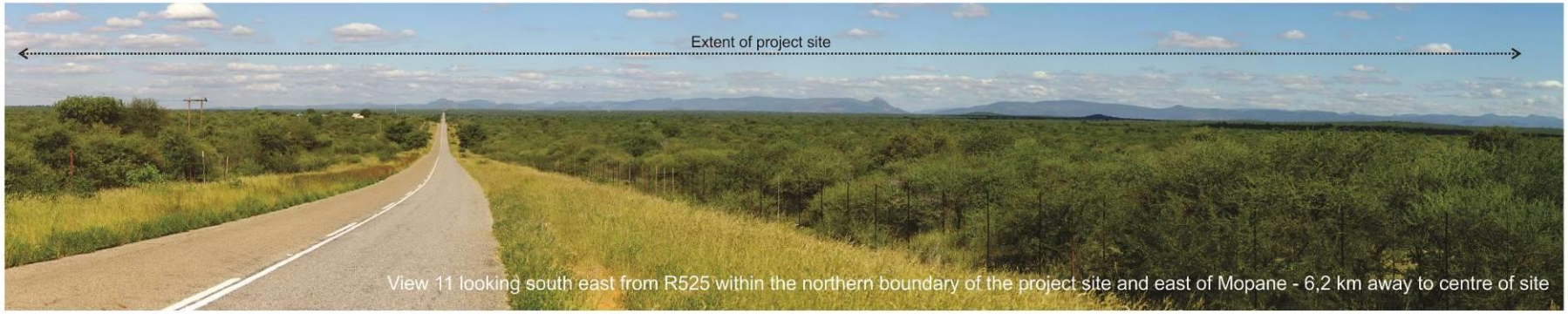


Figure 04-3: LANDSCAPE CHARACTER - Views 7, 8 and 9



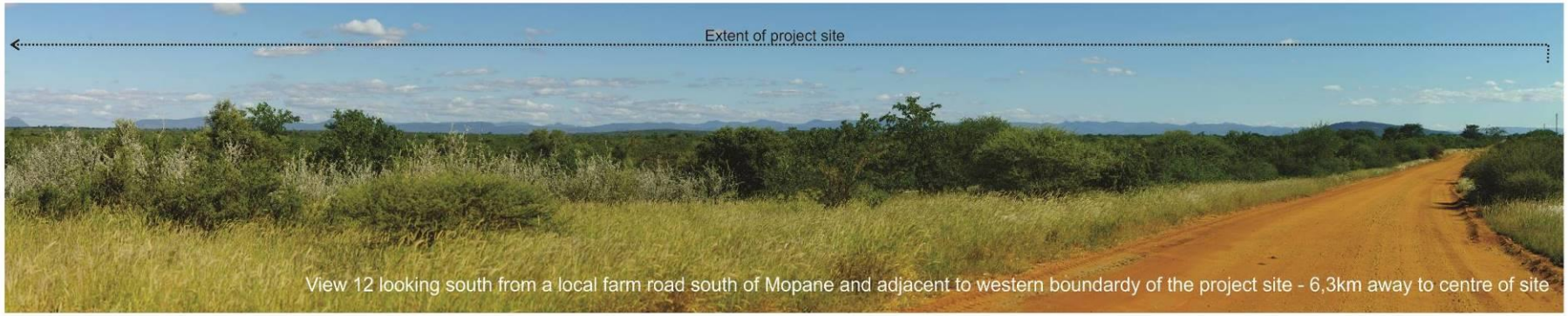


Figure 04-4: LANDSCAPE CHARACTER - Views 10, 11 and 12

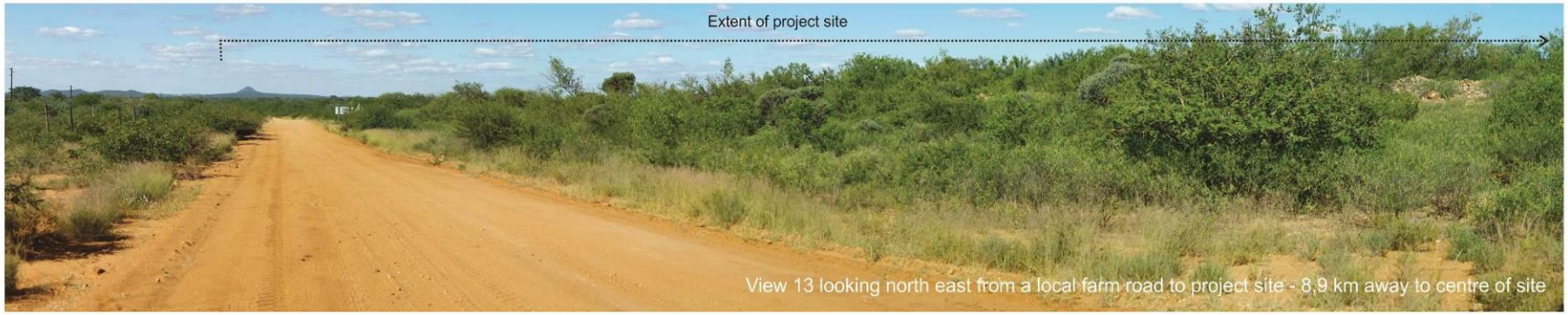


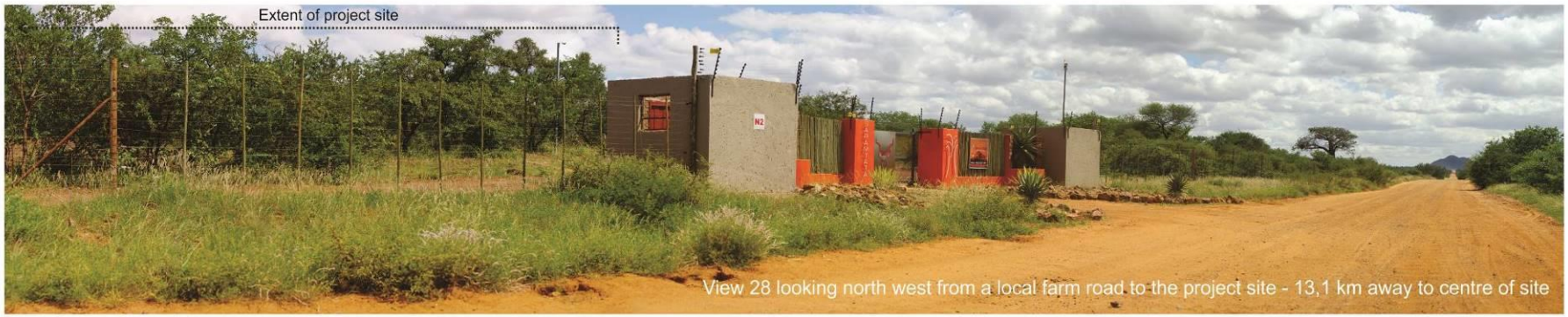
Figure 04-5: LANDSCAPE CHARACTER - Views 13, 14 and 15

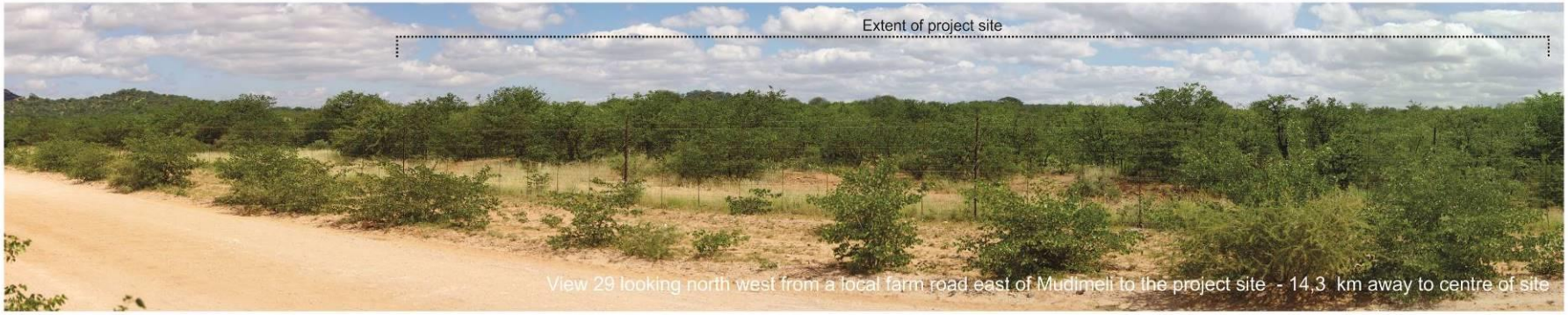
Figure 04-6: LANDSCAPE CHARACTER - Views 16, 17 and 18

Figure 04-7: LANDSCAPE CHARACTER - Views 19, 20 and 21

Figure 04- 8: LANDSCAPE CHARACTER - Views 22, 23 and 24

Figure 04-9: LANDSCAPE CHARACTER - Views 25, 26 and 27





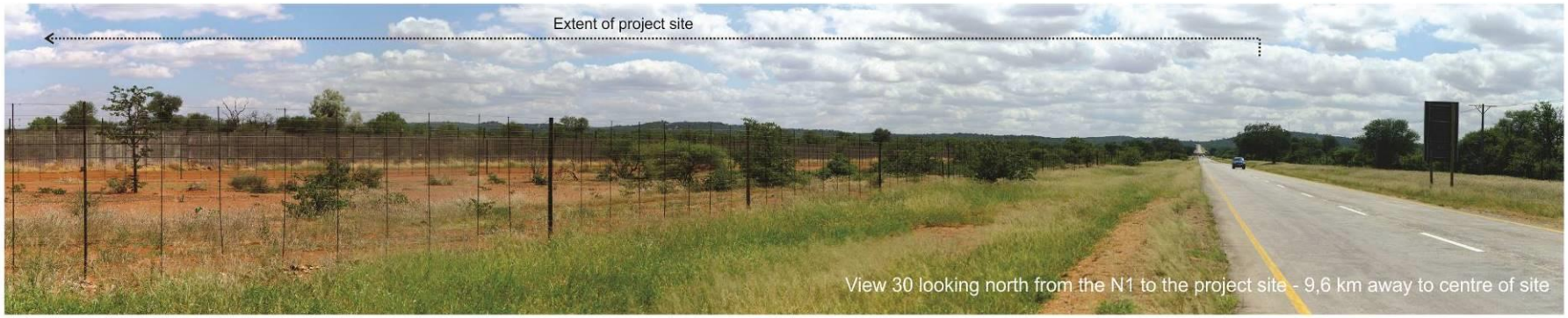


Figure 04-10: LANDSCAPE CHARACTER - Views 28, 29 and 30

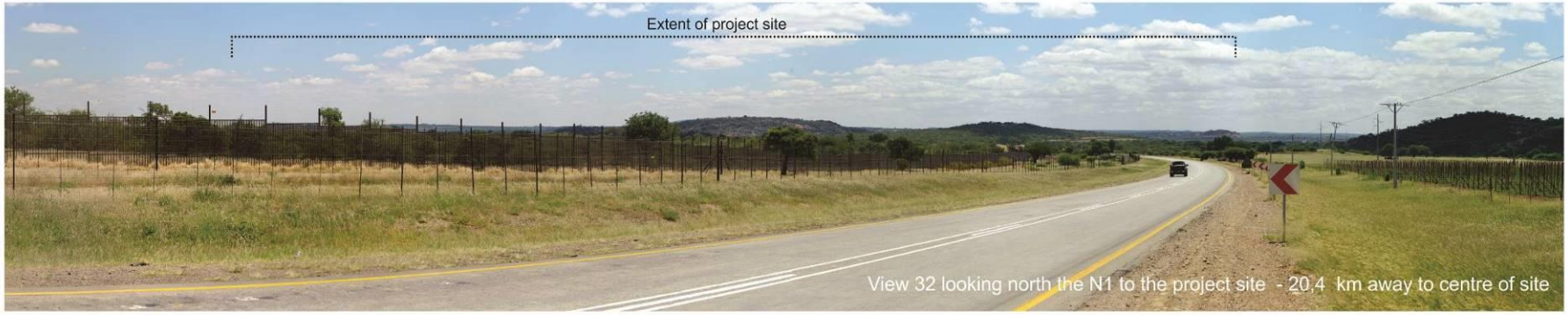


Figure 04-11: LANDSCAPE CHARACTER - Views 31, 32 and 33

8. VISUAL RESOURCE

8.1 Visual Resource Value / Scenic Quality

The scenic quality (using the scenic quality rating criteria described in Appendix A) of the study area is primarily derived from the landscape character described above and illustrated in Figures 5 and 5-1 as vegetation and landscape character types. What these areas look like is illustrated in the panoramas contained in Figures 4–1 to 4-11.

When the criteria listed in Appendix A are taken together, an overall rating within the context of the sub-region, of *low* to *high* is allocated to the study area. The lowest rating is associated with the existing mine located near Mopane and other power and rail infrastructure in the study area. A *high* rating is assigned to the Soutpansberg Mountain located in the southern section to the south of the study site, patches of Limpopo Ridge Bushveld and areas associated to the Sand River, located to the north of the Project site. A *moderate* rating is assigned to the Musina Mopane Bushveld which compromises the rest of the study area and most of the Project site. A summary of the visual resource values, within the context of the sub-region, is tabulated in Table 2 below.

Table 2: Value of the Visual Resource
(After LI-IEMA 2013)

High Mountains and hills associated with the Soutpansberg Mountains, ridges with Limpopo Ridge Bushveld and the Sand River valley	**Moderate** Musina Mopane Bushveld	**Low** Mine near Mopane and utility infrastructure
These landscape types are considered to have a *high* value because they are: Distinct landscapes that exhibit a very positive character with valued features that combine to give the experience of unity, richness and harmony. They are landscapes that may be of particular importance to conserve and which has a strong sense of place. Sensitivity: It is sensitive to change in general and will be detrimentally affected if change is inappropriately dealt with.	This landscape type is considered to have a *moderate* value because it is a: Common landscape that exhibits some positive character, but which has evidence of alteration / degradation/ erosion of features resulting in areas of more mixed character. Sensitivity: It is potentially sensitive to change in general and change may be detrimental if inappropriately dealt with	This landscape type is considered to have a *low* value because it is a: Minimal landscape generally negative in character with few, if any, valued features. Sensitivity: It is not sensitive to change in general and change

8.2 Sense of Place

According to Lynch (1992) sense of place is the extent to which a person can recognize or recall a place as being distinct from other places - as having a vivid, or unique, or at least particular, character of its own. The sense of place for the study area derives from the combination of all landscape types and their impact on the senses. Refer to the views in Figure 4-1 and the aerial photograph in Figure 3.

The study area has a very distinct sense of place derived from the extensive areas of natural vegetation and the presence of the iconic baobab tree, combined with healthy ridge and mountain vegetation and the ever present Soutpansberg mountains in the background, standout koppies and the drainage lines associated with the Sand River. This combination of landscape types is attractive resulting in tourists being drawn to the area to visit the many game farms and nature reserves.

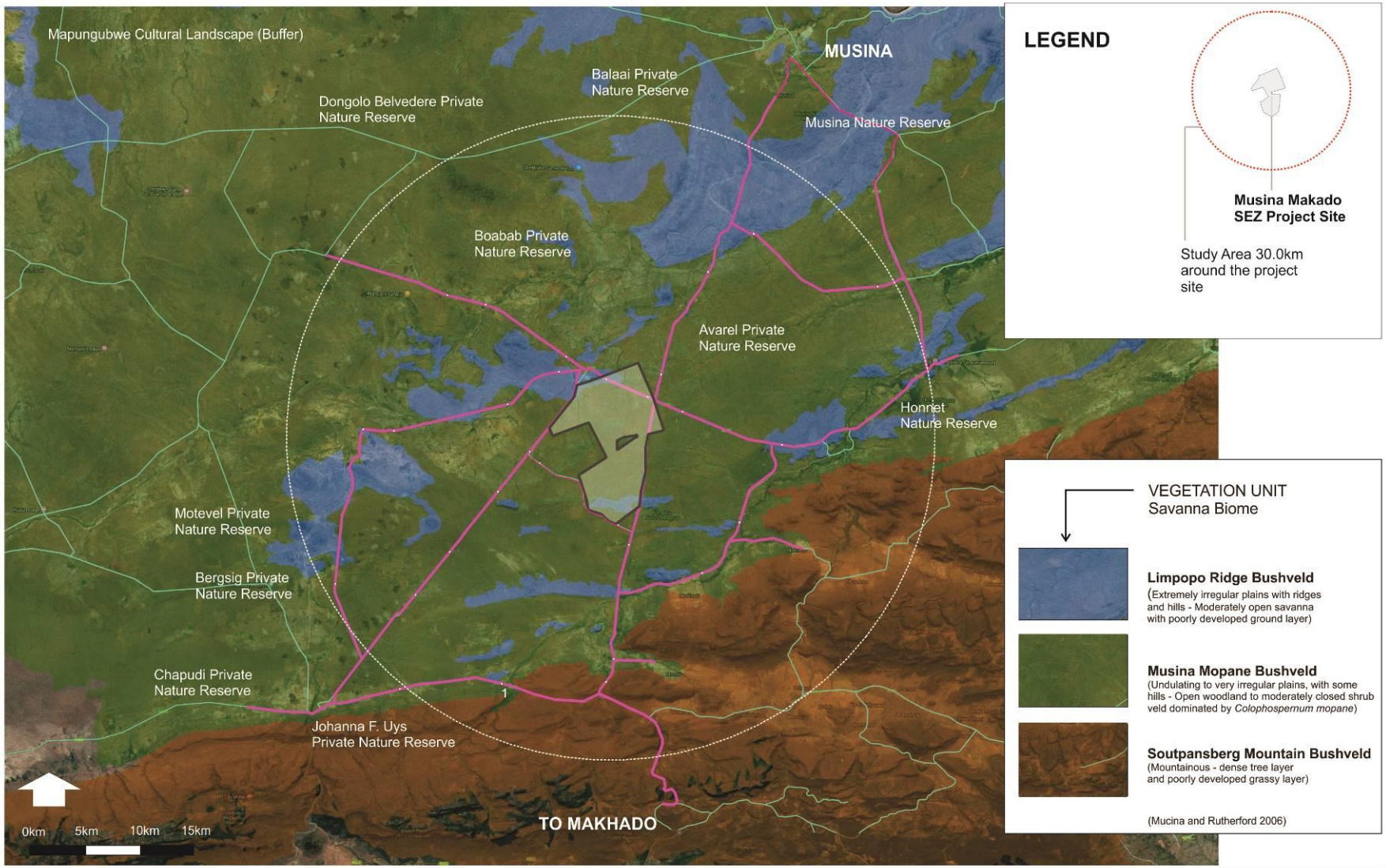


Figure 5: VEGETATION TYPES - Musina Makhado SEZ

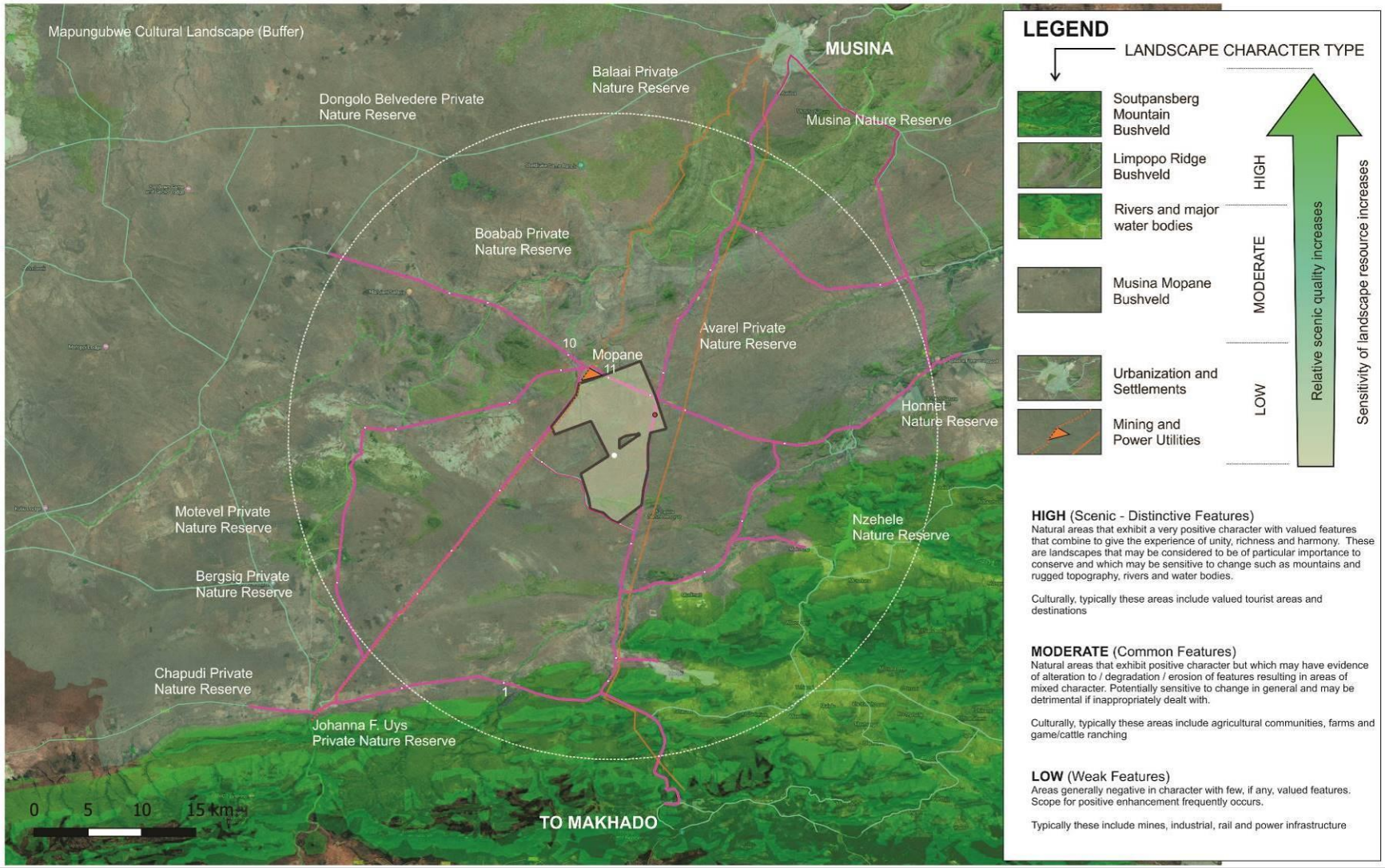


Figure 5-1: LANDSCAPE TYPES AND SENSITIVITIES - Musina Makhado SEZ

9. LANDSCAPE IMPACT

The *landscape impact* (i.e. the change to the fabric and character of the landscape caused by the physical presence of the intervention and which may give rise to changes in its character and from effects to the scenic values of the landscape.) of the proposed Project is ***high.*** The development of the Musina-Makhado SEZ will be seen within a 'Greenfields' landscape context of moderate to high scenic value and which does not contain activities similar to those being proposed. The absorption capacity (i.e. the landscape's ability to absorb physical changes without transformation in its visual character and quality) of the landscape is low as project activities will be intrusive and foreign when considered against current land use in the study area. However, due to the flattish, rolling landscape, the lack of many high observation points (other than from the distant Soutpansberg mountains) and the relatively dense and high savannah, the lower sections of project activities will mostly be screened, thus to an extent, preserving the visual character of the area when viewed from ground level.

As stated in the approach section, the physical change to the landscape at the Project site must be understood in terms of the Project's visibility (specifically from sensitive viewing areas) and its effect on the visual aesthetics of the area (impact on the baseline aesthetic resource). The following sections discuss the effect the Project may have on these.

10. VISUAL IMPACT

Visual impacts will be caused by activities and infrastructure in all Project phases i.e. construction, operation and closure. Activities associated with the Project will be visible to varying degrees from variable distances around the project site (refer to worst case viewsheds in Figures 7 to 7-5). During the construction (preparation) phase of the Musina-Makhado SEZ, the Project's visibility will initially be influenced by the increase in preparatory activities i.e. the removal of vegetation and earthworks to establish platforms for the various buildings and then by the growing height and bulk of the buildings during their construction. Visibility during the operational phase will increase and be influenced by the physical presence of the various components of the Musina-Makhado SEZ and the movement of trucks/trains/vehicles within and to and from the site.

To determine the *intensity* of visual impact, visibility, visual intrusion, visual exposure and viewer sensitivity criteria are used (Appendix B explains the method). When the intensity of impact is qualified with spatial, duration and probability criteria the significance of the impact can be predicted (refer to Appendix C that elaborates on this approach).

10.1 Sensitive Viewers and Locations

Figure 6 identifies potential sensitive receptor locations from which project activities would be visible. These include sections of the N1, the R525, other local/public roads (considered tourist roads), the Sheldrake Game Ranch, the Baobab and Avarel Private Nature Reserves located to the north of the project site as well as elevated viewers along the Soutpansberg Mountain. The Soutpansberg Mountain and associated koppies, block views from the east and south-east, where most of the villages/ settlements are located (as indicated in Figure 6. There is also a ridge line that runs through the southern portion of the site, which blocks views to all but the highest structures as is indicated in Figures 7-1 to 7-5. Sensitive receptors are considered to be people living near the Project site in farmsteads and people visiting local tourism facilities or travelling along the N1, R525 and other local connector roads. Visual sensitivity towards the Project is expected to be high since the study area and project site are currently experienced as "natural" areas with very little man-made disturbances such as mining or industrial related activities. This is borne out when the public raised concerns during the Scoping phase (DeltaBEC 2019) regarding the visual impact. Specific concerns around the impact of the Project on the hunting and tourism indicates a sensitivity towards the Project as both these activities relate to the aesthetic (hunting to a lesser degree) attributes of the sub-region. Table 3 below sets out potential sensitivities.

Table 3: Potential Sensitivity of Visual Receptors

High	**Moderate**	**Low**
Residents in farmsteads located within the study area, visitors / tourist to the Nature reserves and game farms. Travellers on the local tourist roads	Travellers on the N1 and R525 whose purpose for being in the area is not necessarily associated with where they live or tourism	People working in the sub-region whose job is not associated with tourism
These receptors are occupiers of residential / tourist properties, or tourists visiting the area where key views will be negatively affected by the development.	These receptors are people travelling through or past the affected landscape in cars, on trains or other transport routes.	These receptors are visitors and people working within the study area and travelling along local roads whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view.

10.2 Visibility

The 'zone of potential influence' was established at 8,0km. This relates to foreground and middleground zones of the visual envelope[§] where the potential for visual impact is the highest. Over 8,0km the impact of project activities would diminished and recede into the background and most views to the site would be screened by existing vegetation, topography and /or structures, specifically of the low to medium height structures. Refer to the visual exposure diagrams in Appendix B and on Figures 7-1 to 7-5), which illustrate how the visual impact of an object drops away exponentially with distance and at 8,0km it has receded well into the background of panoramic views.

In determining the visibility of the Project the proposed heights of project components was used (Refer to Table 1 and Figure 7 where the proposed heights of buildings and stacks are given). The visibility models are based on topographic relief alone (they have not factored in all tree cover) and therefore are considered as the worst-case scenario. The viewshed models are therefore theoretical and were tested on site, where it became clear that most views to the site from within the zone of potential influence and the study area, would be blocked by existing vegetation. This is specifically the case for views from east of the site, where the tree cover tends to be higher.

Offsets (refer to Figure 7 for these) equivalent to the current heights and proposed final heights of project components were used to generate the viewsheds illustrated in Figures 7-1 to 7-5. The viewshed in Figure 7-1 indicates the visibility of: low structures (i.e. up to 15m); Figure 7-2 is medium height structures (up to 30m); Figure 7-3 for tall structures (up to 80m); and Figure 7-4 for very tall structures (up to 210m). Figure 7-5 combines all these into a consolidated viewshed indicative of the overall visibility of the Project.

[§] The area from which a project component would be visible.

Figure 7-5 indicates that the potential visibility of the Project (worst case scenario) extends throughout the study area's central sections, with less visibility in the northern extremes and a large portion of the southern and south eastern sections being blocked by a ridge line that passes through the southern section of the site. The potential for visual impact is potentially high for sensitive viewing areas as is indicated in the viewshed analyses. However, the combination of the existing tall vegetation and the flat to rolling topography, results in the landscape having a high VAC. The outcome being that most views to project activities from within the study area would be blocked of partially blocked. Only the very tall elements (i.e. the stacks), would protrude above the tree line. The effect of vegetation on visibility is evident in the simulations (Views 11, 12, 13, 24, and 26) in Figures 8-1 to 8-5. Refer to Figure 6 for the location of the viewing points.

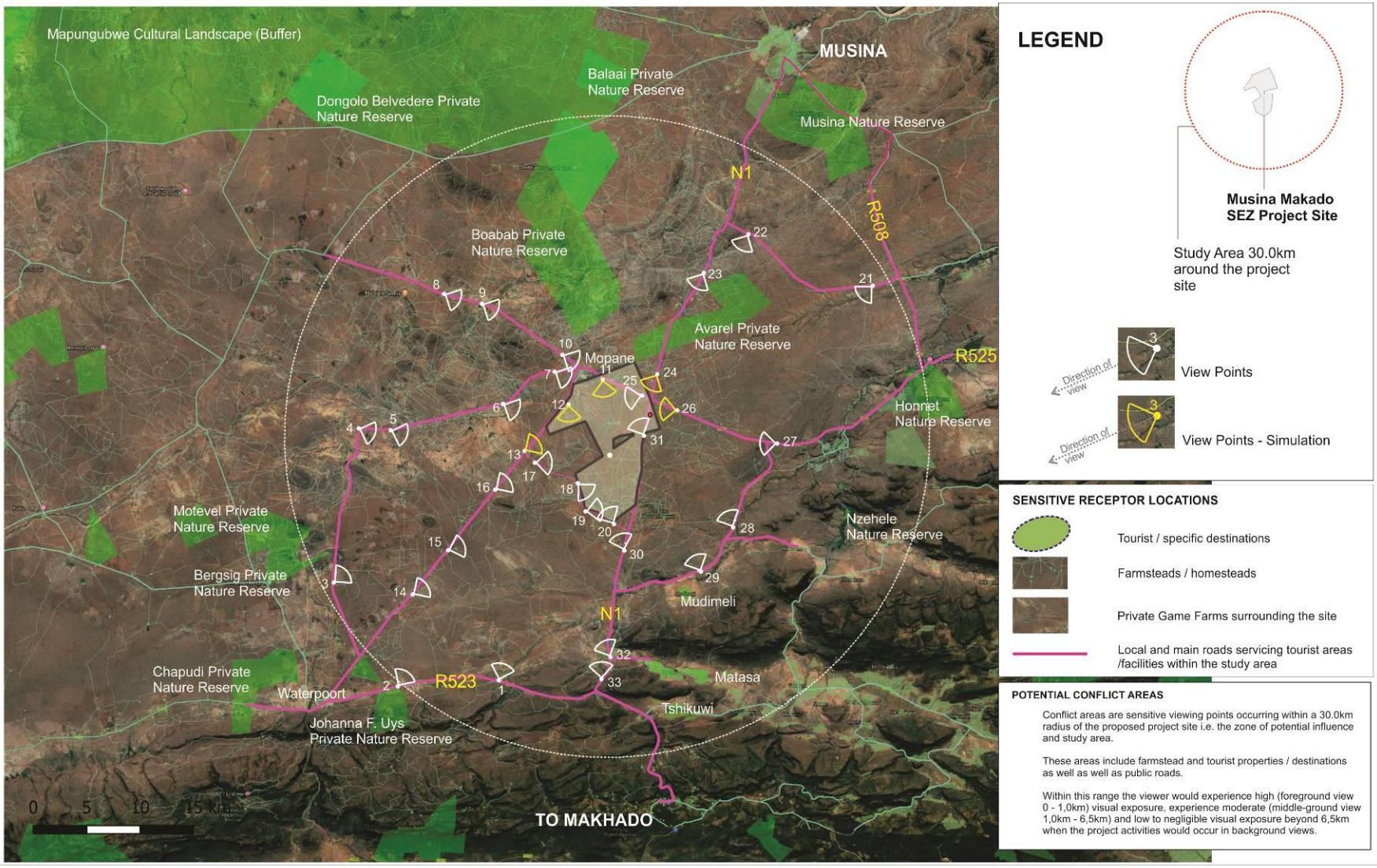


Figure 6: RECEPTOR SENSITIVITIES - Musina Makhado SEZ

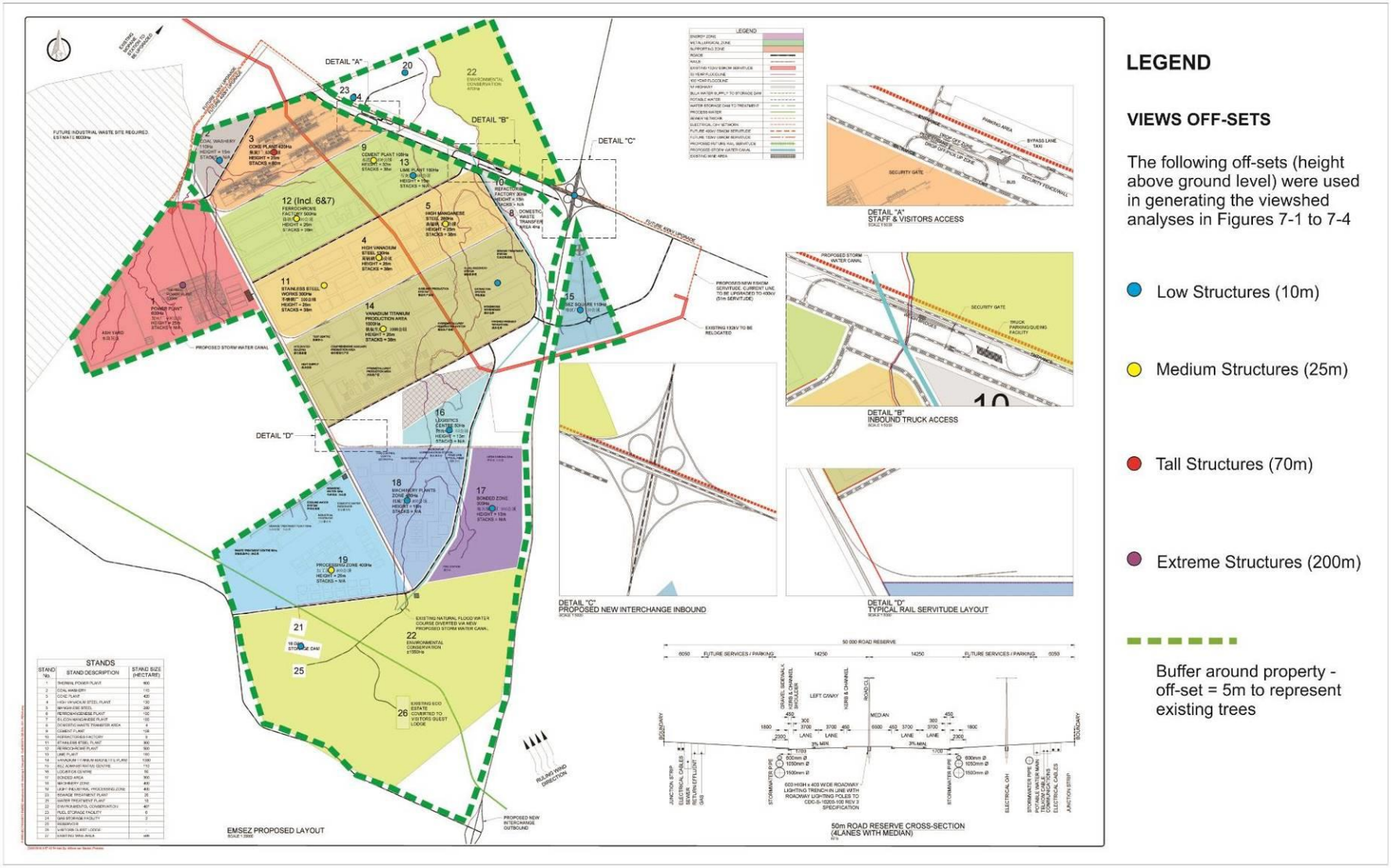


Figure 7: VIEWSHED OFF-SETS - Musina Makhado SEZ

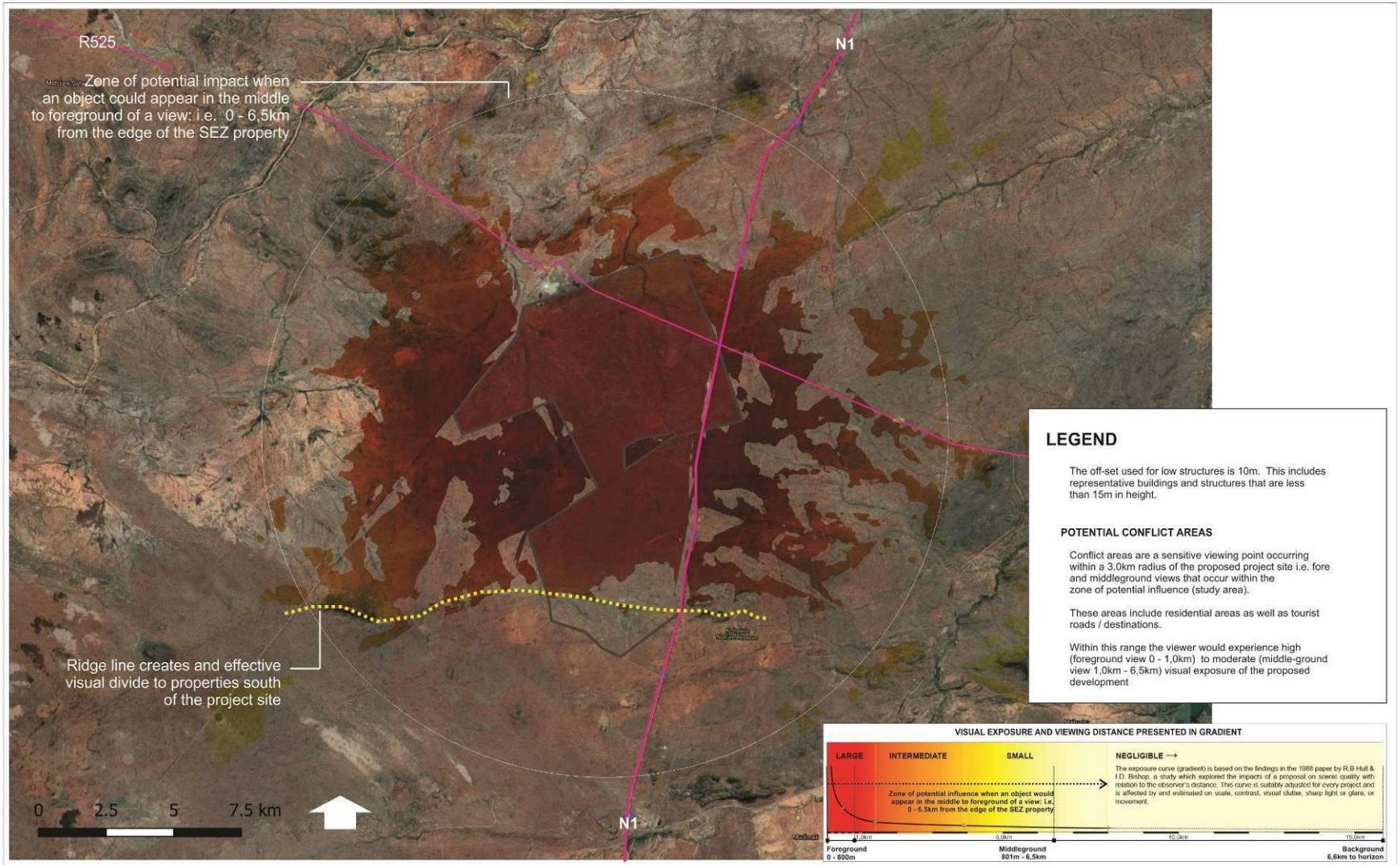


Figure 7-1: VIEWSHED: LOW STRUCTURES - Musina Makhado SEZ

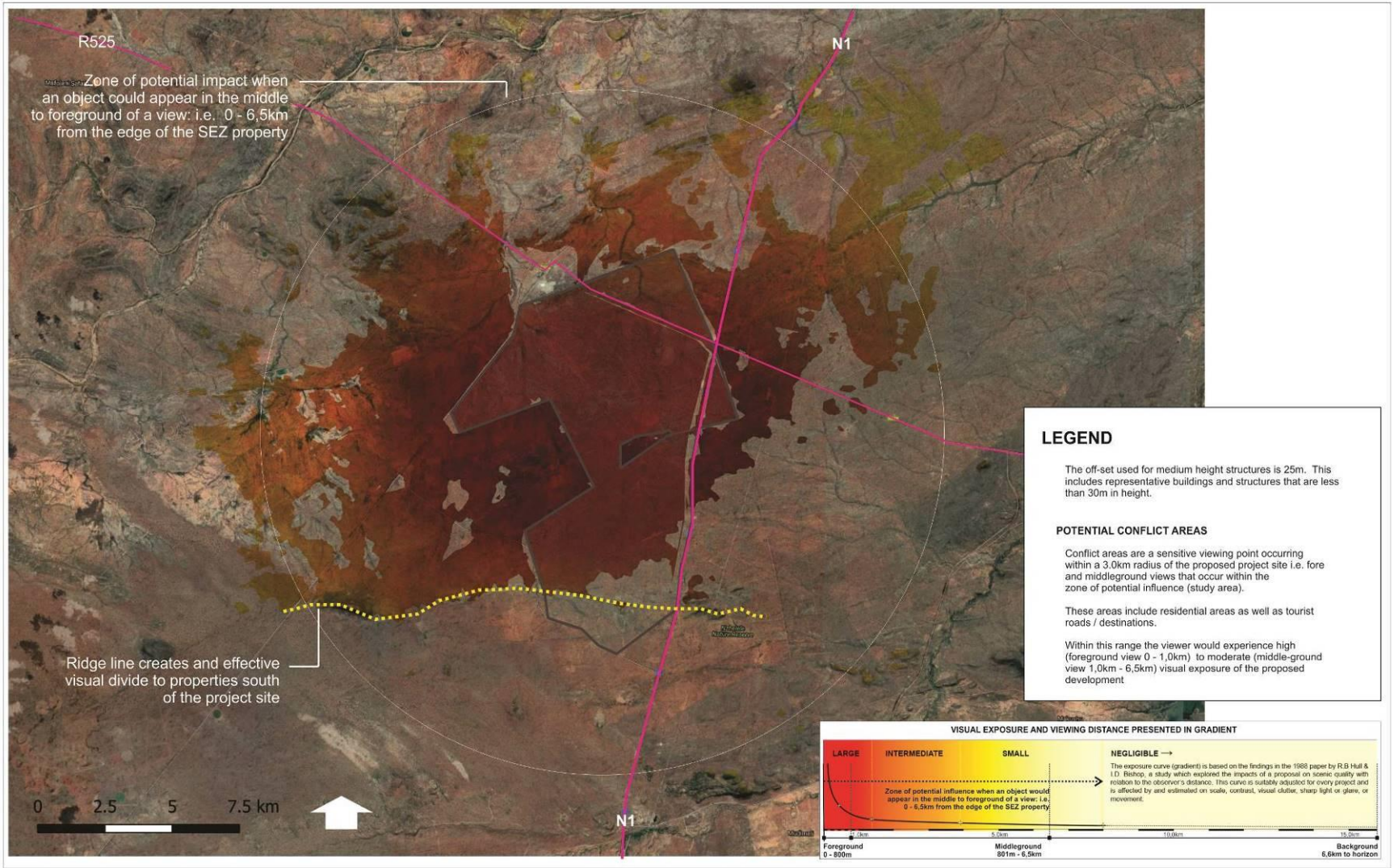


Figure 7-2: VIEWSHED: MEDIUM HEIGHT STRUCTURES - Musina Makhado SEZ

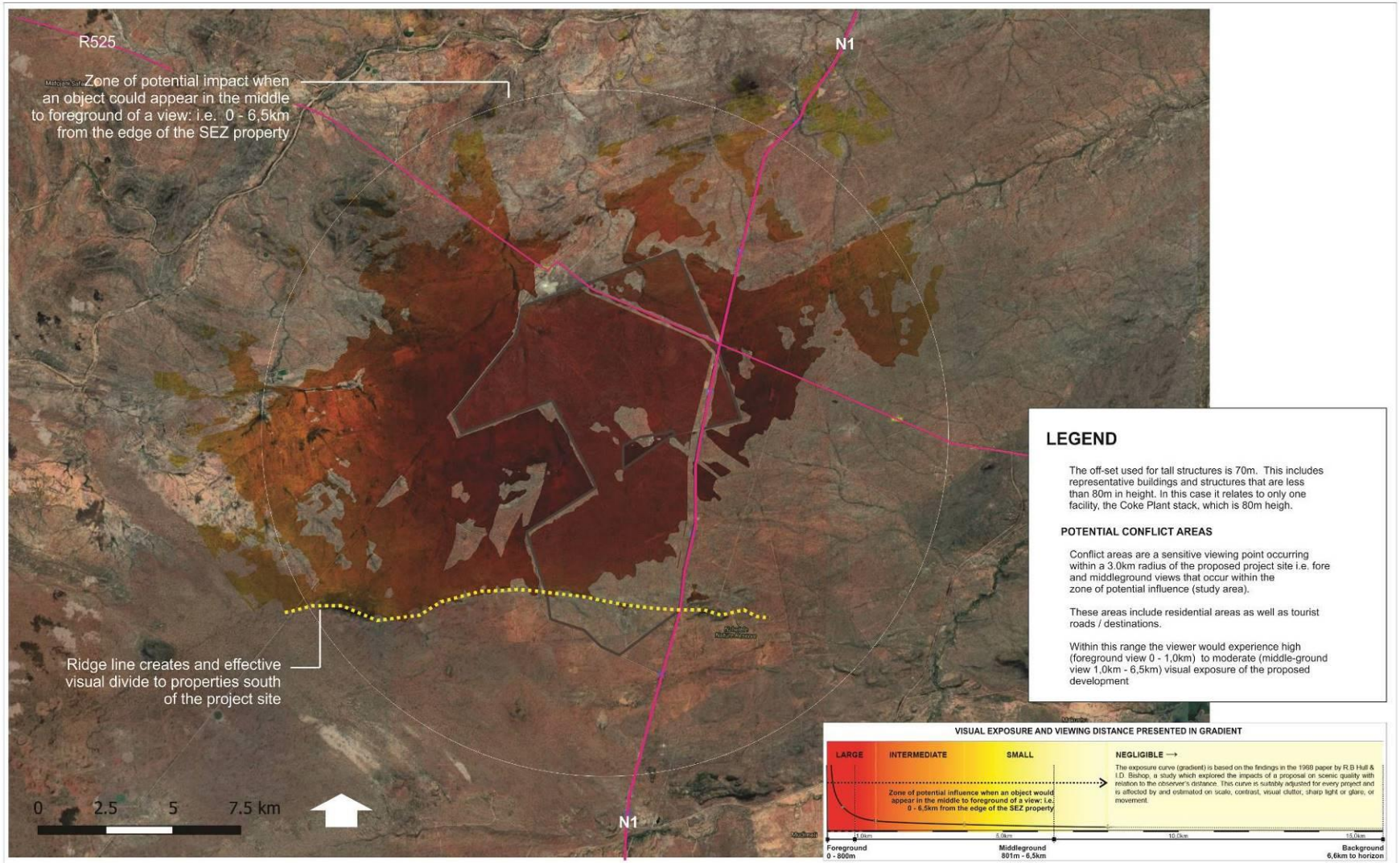


Figure 7-3: VIEWSHED: TALL STRUCTURES - Musina Makhado SEZ

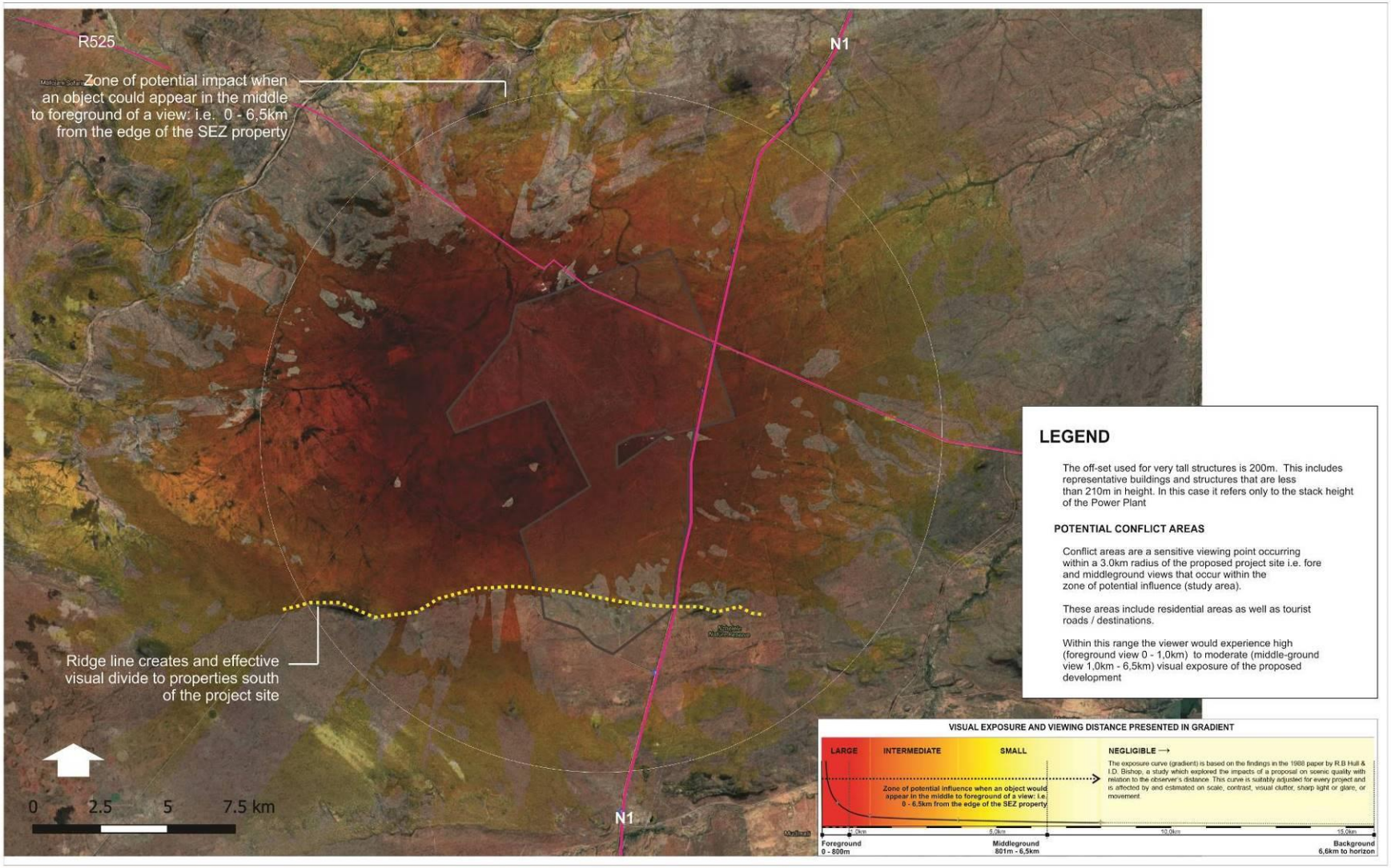


Figure 7-4: VIEWSHED: VERY TALL STRUCTURES - Musina Makhado SEZ

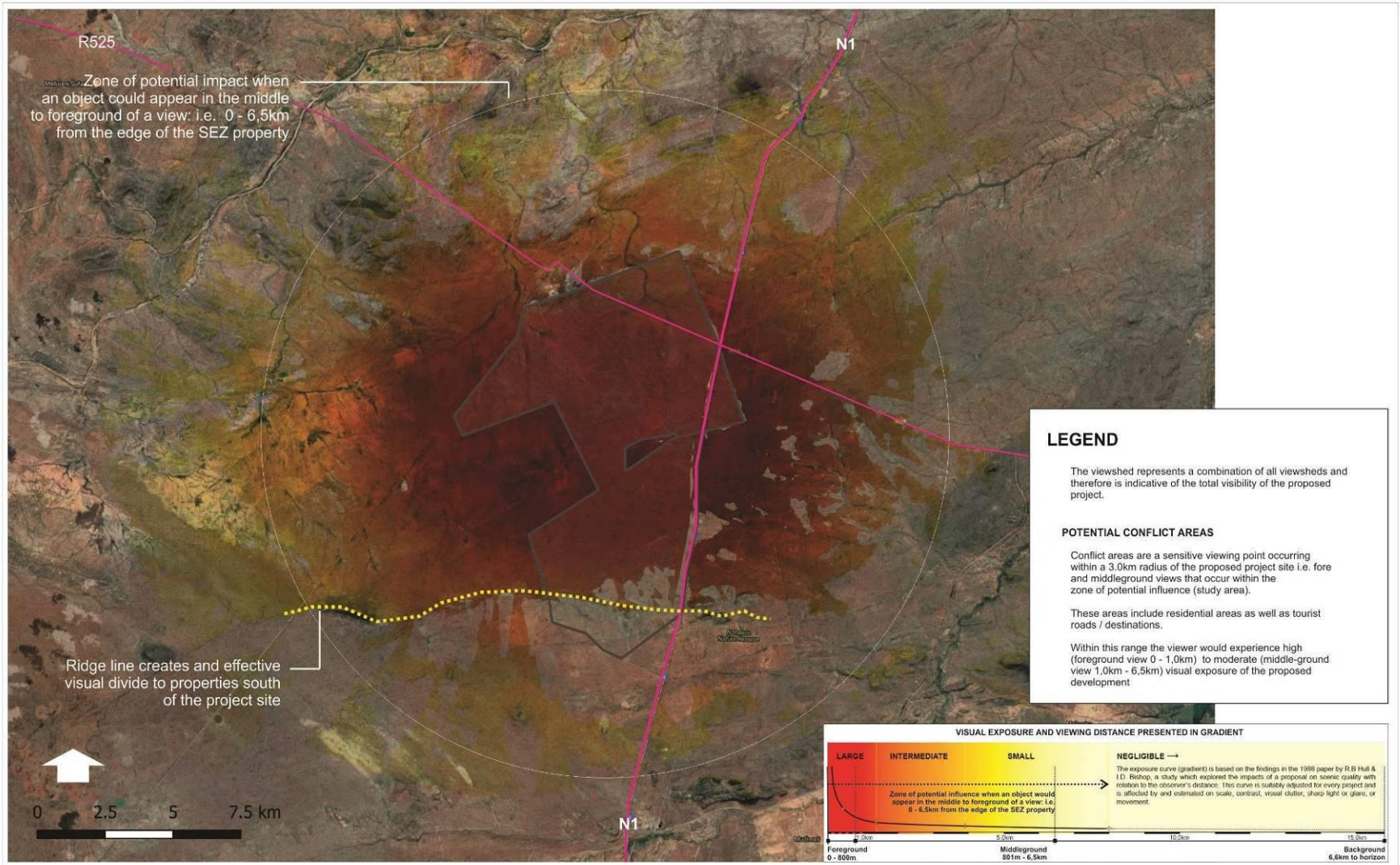


Figure 7-5: VIEWSHED: COMBINED ALL STRUCTURES - Musina Makhado SEZ

10.3 Visual Exposure

Visual exposure is determined by qualifying visibility with a distance rating to indicate the degree of potential intrusion and visual acuity.

Table 4 below indicates the exposure of the receptor sensitivity zones identified in Section 10.1 and as illustrated in Figure 6 above. Distance from a viewer to a viewed object or area of the landscape, influences how visual changes are perceived in the landscape (see also Appendix B, which illustrates this point). Generally, changes in form, line, colour, and texture in the landscape become less perceptible with increasing distance or colour and texture compatibility. Table 4 indicates sensitive viewing areas an their potential exposure to views of project activities.

Table 4: Sensitive Receptors – Visual Exposure

	Foreground view i.e. 0 – 800m from Project Site	Middle-ground view i.e. 800m to – 8,0km from Project Site boundary	Background view i.e. > 8,0km from Project Site boundary
Farmsteads	**X** obstructed or partially blocked views due to the vegetation and topography.	**X** mostly obstructed to partially blocked by vegetation and topography	**X** mostly obstructed and blocked by vegetation and topography, only tallest structures visible
People travelling on local roads, the N1 and R525.	**X** obstructed or partially blocked views due to the vegetation and topography.	**X** mostly obstructed to partially blocked by vegetation and topography	**X** mostly obstructed and blocked by vegetation and topography, only tallest structures visible
Game Ranches surrounding the site	**X** obstructed or partially blocked views due to the vegetation and topography.	**X** mostly obstructed to partially blocked by vegetation and topography	**X** mostly obstructed and blocked by vegetation and topography, only tallest structures visible
Baobab Private Nature Reserve			**X** mostly obstructed and blocked by vegetation and topography, only tallest structures visible
Avarel Private Nature Reserve	**X** obstructed or partially blocked views due to the vegetation and topography.	**X** mostly obstructed to partially blocked by vegetation and topography	
Nzhelele Private Nature Reserve			**X** mostly obstructed to partially blocked by mountains. Views from elevated areas of the

			Soutpansberg will be clear.
Honnet Nature Reserve			**X** mostly obstructed to partially blocked by vegetation and topography

10.4 Visual Intrusion

Visual intrusion deals with the notion of contextualism i.e. how well does a project component fit with or disrupt / enhance the ecological and cultural aesthetic of the landscape as a whole? And ties in with the concept of visual absorption capacity (VAC), which for the project site, is moderate (western side of site) to high (remainder of the site) due to the bush cover throughout the site and study area.

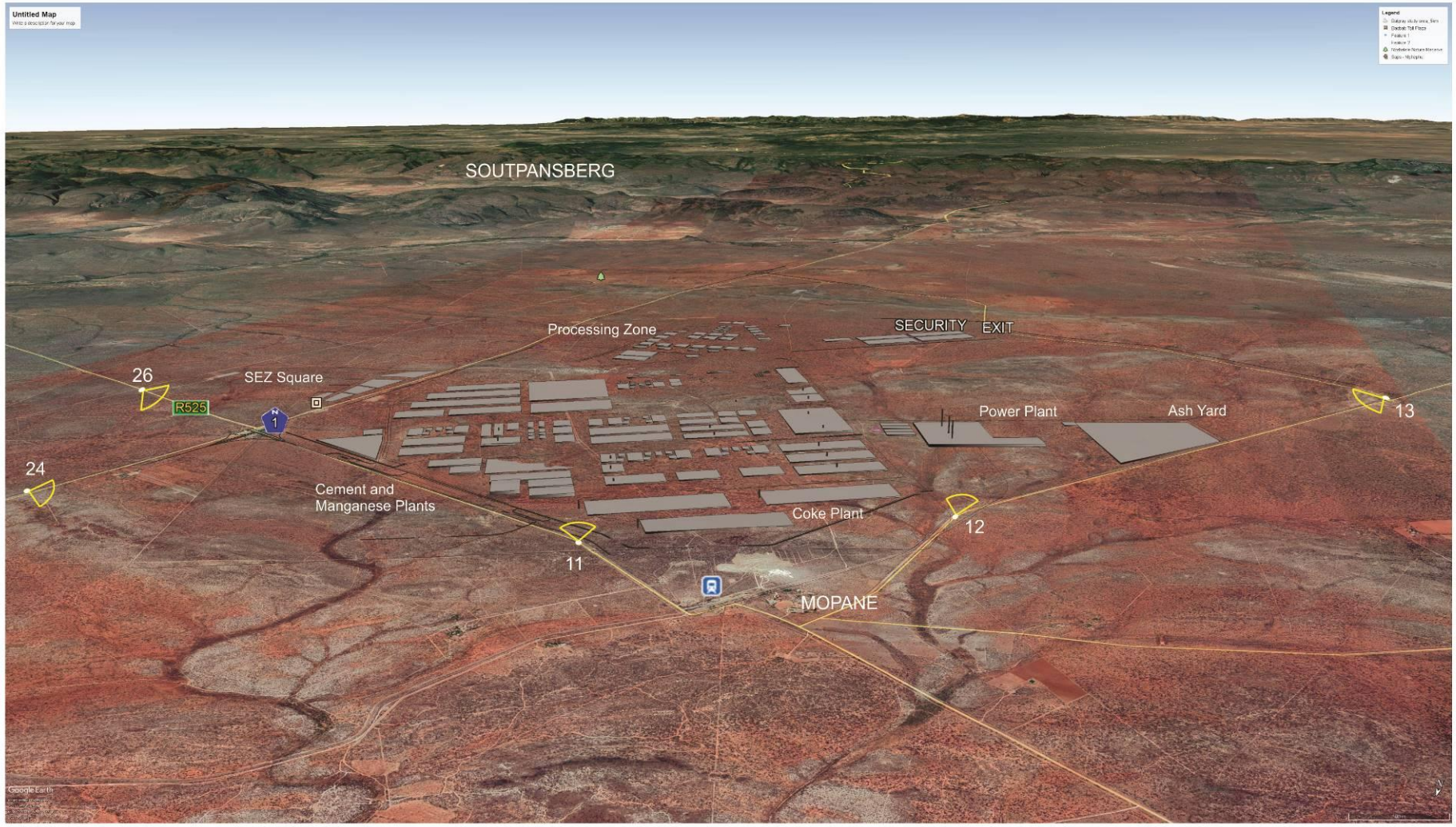
The simulations in Figures 8-1 to 8-5 illustrate the major screening effect that vegetation will have on the project activities when viewed from five typical sensitive viewing areas about the project site. Project activities, when visible (most views will at the very least, be partially screened), will be seen in the middle-ground to back-ground of views (refer to Figures 8-1, 8-3, 8-4 and 8-5) from the local road and homesteads south west of the site. However, the Coke, Cement, Lime and High Manganese Plants will be visible (but partially screened) in the foreground of views from the R525, which passes immediately north of the site (refer to Figure 8-2). The 38m high stacks for most of the plants, along with the 210m stacks of the power plant, will protrude above the tree line and would be visible in middle ground (up to 8,0km) and background (> 8,0km) views as is indicated in Figures 8-2 and 8-3. However, the bulk of SEZ buildings and structures will be partially to completed absorbed by the existing tree cover as is evident in the simulations in Figures 8-4 to 8-5 when viewed from sensitive viewing areas about the site.

Visual intrusion of the proposed Project, from areas immediately west and north of the project site, is high (moderate VAC), and moderate to low (high VAC) for areas south and east of the site (farmsteads and game ranches). Table 5 below explains these findings.

Table 5: Visual Intrusion

High For sensitive areas west and north (the R525) of the site (including farmsteads, game farms and the Waterpoort Mopane road) and the N1 / R525 interchange	**Moderate** For sensitive areas south west of the site (including the Waterpoort Mopane road and farmsteads and game farms)	**Low** For sensitive areas east of the site and the N1 generally
The Project would: • have a substantial negative effect on the visual quality (sense of place) of the	The Project would: • have a moderate negative effect on the visual quality (sense of place) of the landscape;	The Project would: • have a minimal effect on the visual quality (sense of place) of the landscape;

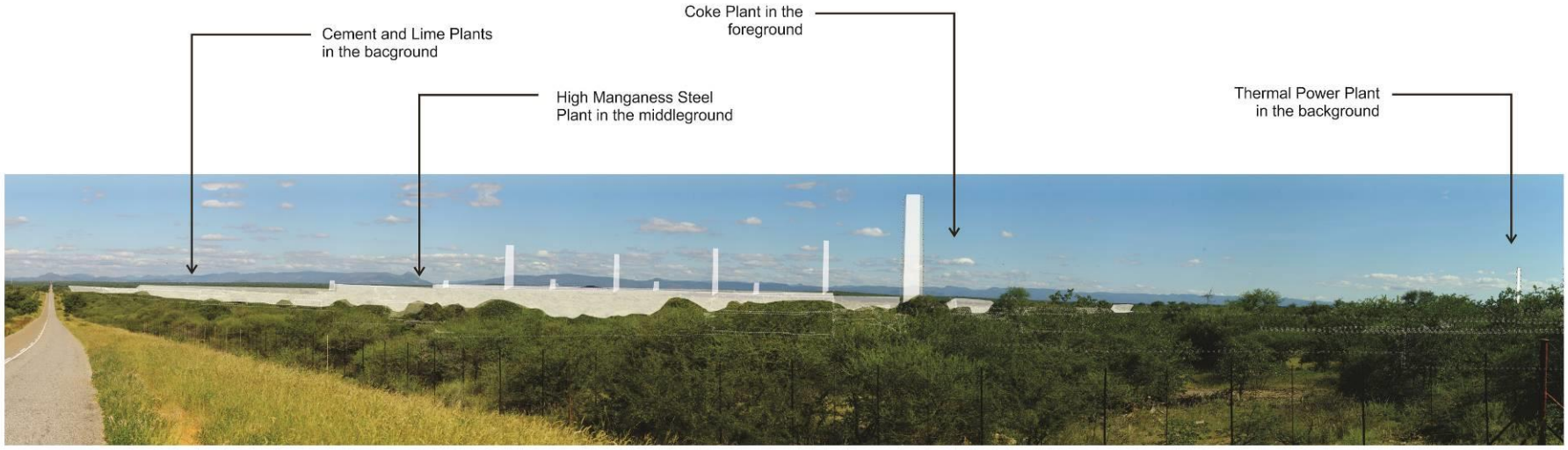
landscape relative to the baseline landscape because it would: • Contrast with the patterns or elements that define the structure of the landscape;	• Contrast moderately with the current patterns or elements that define the structure of the landscape;	• Contrasts minimally with the patterns or cultural elements (mines) that define the structure of the landscape;
RESULT: An intensive change over a localized area resulting in major changes in key views and would therefore have a major contribution on the intensity of potential visual impact	*RESULT:* Moderate change in landscape characteristics over localized area resulting in a moderate change to key views and would therefore have a moderate contribution on the intensity of potential visual impact	*RESULT:* Minimal change resulting in a minor change to key views from sensitive viewing areas and would therefore have a minor contribution on the intensity of potential visual impact.



Aerial View looking south east from immediately north west of the site - AFTER DEVELOPMENT

Figure 8: SIMULATION AERIAL - Musina Makhado SEZ

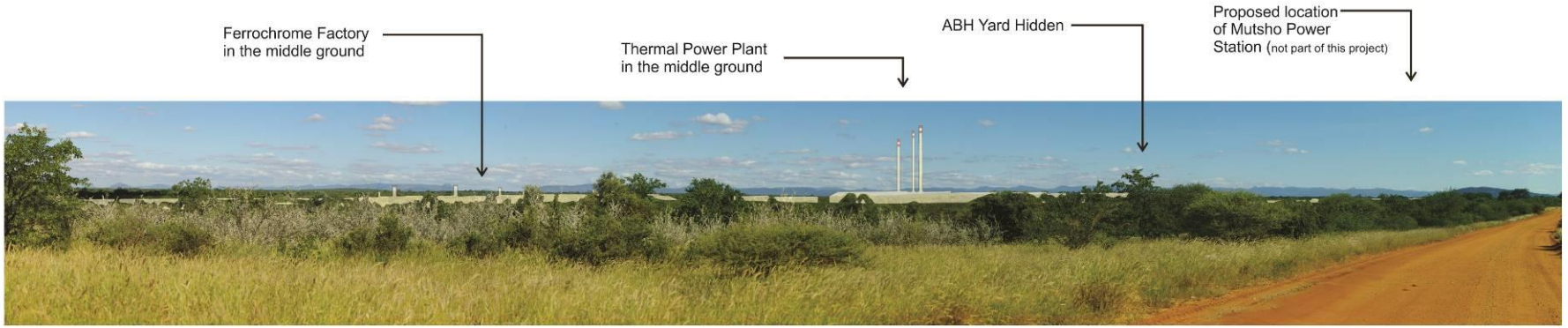
View 11 looking south east from a the R525 to the site - BEFORE DEVELOPMENT



View 11 looking south east from a the R525 to the site with the Coke Plant in the foreground - 800m away - BEFORE DEVELOPMENT

Figure 8-1: SIMULATION VIEW 11 - Musina Makhado SEZ

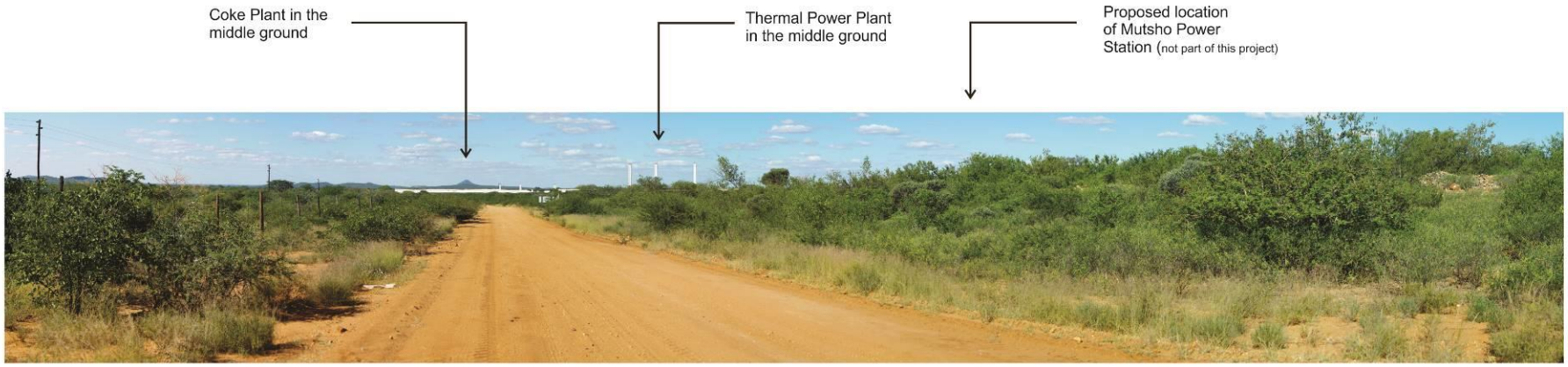
View 12 looking south from a local road west of the project site to the Power Station - 2,4 km away - BEFORE DEVELOPMENT



View 12 looking south from a local road west of the project site to the Power Station - 2,4 km away - AFTER DEVELOPMENT

Figure 8-2: SIMULATION VIEW 12 - Musina Makhado SEZ

View 13 looking north east from the Waterpoort - Mopane road west of the project site - BEFORE DEVELOPMENT



View 13 looking north east from the Waterpoort - Mopane road west of the project site to the Power Station 5,4km away - AFTER DEVELOPMENT

Figure 8-3: SIMULATION VIEW 13 - Musina Makhado SEZ

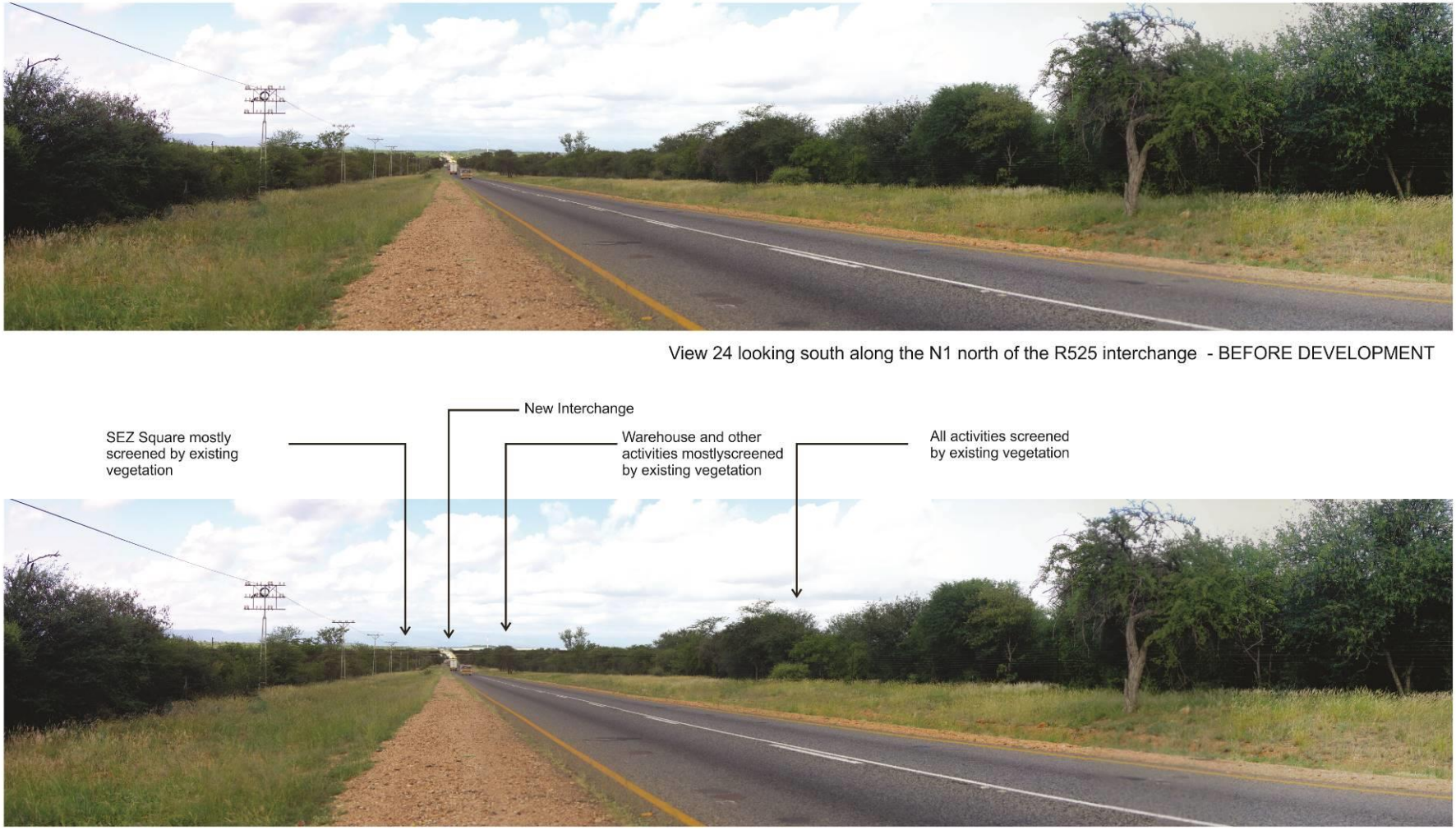
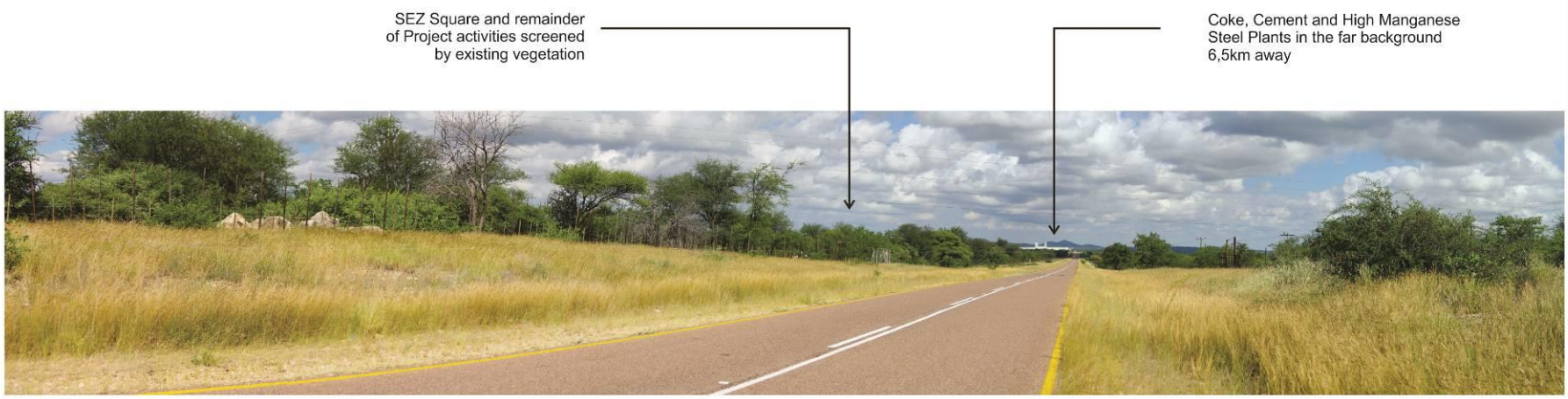


Figure 8-4: SIMULATION VIEW 24 - Musina Makhado SEZ

View 26 looking west along the R525 east of the N1 interchange - BEFORE DEVELOPMENT



View 26 looking west along the R525 east of the N1 interchange - AFTER DEVELOPMENT

Figure 8-5: SIMULATION VIEW 26 - Musina Makhado SEZ

10.5 Intensity of Impact

Referring to the discussions above and using the criteria listed in Appendix B at the back of the report, the intensity of visual impact of the Project is rated in Table 6 below. To assess the intensity of impact four main factors are considered.

- *Visual Intrusion:* The nature of intrusion or contrast (physical characteristics) of a project component on the visual quality of the surrounding environment and its compatibility/discord with the landscape and surrounding land use, within the context of the landscape's VAC.
- *Visibility:* The area / points from which project components will be visible.
- *Visual exposure:* Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion.
- *Sensitivity:* Sensitivity of visual receptors to the proposed development

In synthesising the criteria used to establish the intensity of visual impact, a numerical or weighting system is avoided. Attempting to attach a precise numerical value to qualitative resources is rarely successful, and should not be used as a substitute for reasoned professional judgement (LI-IEMA 2013). In determining the intensity of impact, the worst-case scenario is considered. The following therefore applies:

Visual intrusion: High particularly for sensitive areas immediately north (R525) and west (Mopane Waterpoort road) and farmsteads and game farms

Visibility: Visibility is potential high, but due to the high VAC of the landscape only the taller structures (38m and 210m) stacks are highly visible. General visibility is therefore moderate other than in the areas immediately north and west of the project site

Visual exposure: A high visual exposure is also predicted for sensitive areas immediately north and west of the project site

Sensitivity: Has been established as high for the project due to the dramatic change in land use from a Greenfields site to an extensive industrial site.

According to the results tabulated below in Table 6 the intensity of visual impact (based on the worst case scenario) of the proposed Project will be *high* but localized, as it will cause a major loss of or alteration to key landscape elements and visual characteristics of the baseline.

Table 6: *Intensity* of Impact (without mitigation)

High For sensitive areas with fore (up to 800m) views of project activities, west and north (the R525) of the site (including farmsteads in raised locations, game farms and the Waterpoort Mopane road) and the N1 / R525 interchange	**Moderate** For sensitive areas south west of the site with middle ground views (800m to 8,0km) of project activities (including the Waterpoort Mopane road and farmsteads and game farms)	**Low** For sensitive areas generally about the site with background views (>8,0km) and the N1 generally north and south of the R525	**Negligible to none** For sensitive areas beyond middleground views (>8,0km) and the remainder of the study area
Total loss of or major alteration to key elements / features / characteristics of the baseline. i.e. Pre-development landscape or view and / or introduction of elements considered to be totally uncharacteristic when set within the attributes of the receiving landscape. High scenic quality impacts would result.	Partial loss of or alteration to key elements / features / characteristics of the baseline. i.e. Pre-development landscape or view and / or introduction of elements that may be prominent but may not necessarily be substantially uncharacteristic when set within the attributes of the receiving landscape. Moderate scenic quality impacts would result	Minor loss of or alteration to key elements / features / characteristics of the baseline. i.e. Pre-development landscape or view and / or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape. Low scenic quality impacts would result.	Very minor loss or alteration to key elements/features/characteristics of the baseline. i.e. Pre-development landscape or view and / or introduction of elements that is not uncharacteristic with the surrounding landscape – approximating the 'no change' situation. Negligible scenic quality impacts would result.

11. MANAGEMENT MEASURES

In considering mitigating measures three rules are considered - the measures should be feasible (economically), effective (how long will it take to implement and what provision is made for management / maintenance) and acceptable (within the framework of the existing landscape and land use policies for the area). To address these, the following principles have been established:

- Mitigation measures should be designed to suit the existing landscape character and needs of the locality. They should respect and build upon landscape distinctiveness.
- It should be recognized that many mitigation measures, especially the establishment of planted screens and rehabilitation, are not immediately effective.

The following general mitigation measures are suggested and should be included as part of the Environmental Management Programme (EMPr).

11.1 Site development and planning

- With the preparation of the portions of land onto which the activity will take place the minimum amount of existing vegetation and topsoil should be removed.
- Ensure, wherever possible, natural indigenous vegetation is retained and incorporated into the site rehabilitation.
- Ensure a 50m buffer of existing vegetation is maintained along the boundary of the project site
- All top-soil that occurs within the proposed footprint of an activity must be removed and stockpiled for later use when areas that have been disturbed must be rehabilitated.
- Specifications with regards to the placement of construction camps, as well as a site plan of the construction camp, indicating waste areas, storage areas and placement of ablution facilities should be included in the EMPr. These areas should either be screened or positioned in areas where they would be less visible from farmsteads/game farms and main roads.
- Construction activities should be limited to between 08:00 and 17:00 or in conjunction with the ECO.

11.2 Earthworks

Earthworks in these areas should be executed in such a way that only the footprint and a small 'construction buffer zone' around the proposed Project is exposed. In all other areas, the natural occurring vegetation, should be retained, especially along the periphery of the site. Dust suppression techniques should be in place always during all phases of the project, where required. Any soil must be exposed for the minimum time possible once cleared of vegetation to avoid prolonged exposure to wind and water erosion and to minimise dust generation.

11.3 Landscaping and ecological approach

Where new vegetation is proposed to be introduced to the site, an ecological approach to rehabilitation, as opposed to a horticultural approach should be adopted. For example, communities of indigenous plants enhance biodiversity, a desirable outcome for the project rehabilitation. This approach can significantly reduce long term costs as less maintenance would be required over conventional methods one the vegetation is established.

11.4 Vegetation Buffer / Visual Screen

- Ensure at least a 50m vegetation buffer must be retained not only around the Project site but also, if possible, around the individual components/sites, within the footprint of the Project site (Figure 9)
- The density of the vegetation within buffer zones and where vegetation has not been impacted should be increased
- Planting of exotic grasses during rehabilitation should not occur, instead, non-invasive indigenous flora should be used where required during rehabilitation.

11.5 Structures and associated infrastructure

Paint all structures with colours that reflect and compliment the colours of the surrounding landscape. To further reduce the potential of glare, the external surfaces of structures should be articulated or textured to create interplay of light and shade. Avoid pure whites and blacks.

11.6 Good house-keeping

During construction of the project, all roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface.

11.7 Lighting

Light pollution is largely the result of bad lighting design, which allows artificial light to shine outward and upward into the sky, where it's not wanted, instead of focusing the light downward, where it is needed. Ill designed lighting washes out the darkness of the night sky and radically alters the light levels in rural areas where light sources shine as 'beacons' against the dark sky and are generally not wanted.

Of all the pollutions faced, light pollution is perhaps the most easily remedied. Simple changes in lighting design and installation yield immediate changes in the amount of light spilled into the atmosphere. The following are measures that must be considered in the lighting design of the Project:

- Install light fixtures that provide precisely directed illumination to reduce light “spillage” beyond the immediate surrounds of the site.
- Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on illegal entry to the site.
- Minimise the number of light fixtures to the bare minimum, including security lighting.

11.8 Environmental Offsets

Environmental offsets can be considered to compensate for impacts predicted to exist in the long term. These are actions that provide environmental benefits which counterbalance the significant long term and residual environmental impacts or risks of the Project. Unlike the proposed mitigation actions which occur on-site as part of the project and reduce the direct impact of the Project, offsets would be undertaken outside of the project area and counterbalance significant residual impacts.

11.9 Mitigation Potential

Mitigation is difficult due to the scale and bulk of Project activities. The landscape, however, has a high VAC due to the nature of the vegetation and the relative flatness of the topography. Mitigation should therefore focus on retaining as much existing vegetation as possible and ensuring that structures and buildings are designed to blend with the natural landscape to reduce the contrast of the new structures with their surroundings. Image 2, of a nuclear power station in the United Kingdom, illustrates this method. The potential for successful mitigation (given the nature of the Project), is relatively high (other than a few elevated positions south of the site and localised areas immediately north and west of the site) as most views will be from ground level and would be blocked or partially blocked by existing vegetation.

Image 2: Blending structures with the natural environment (LI-IEMA 1996),

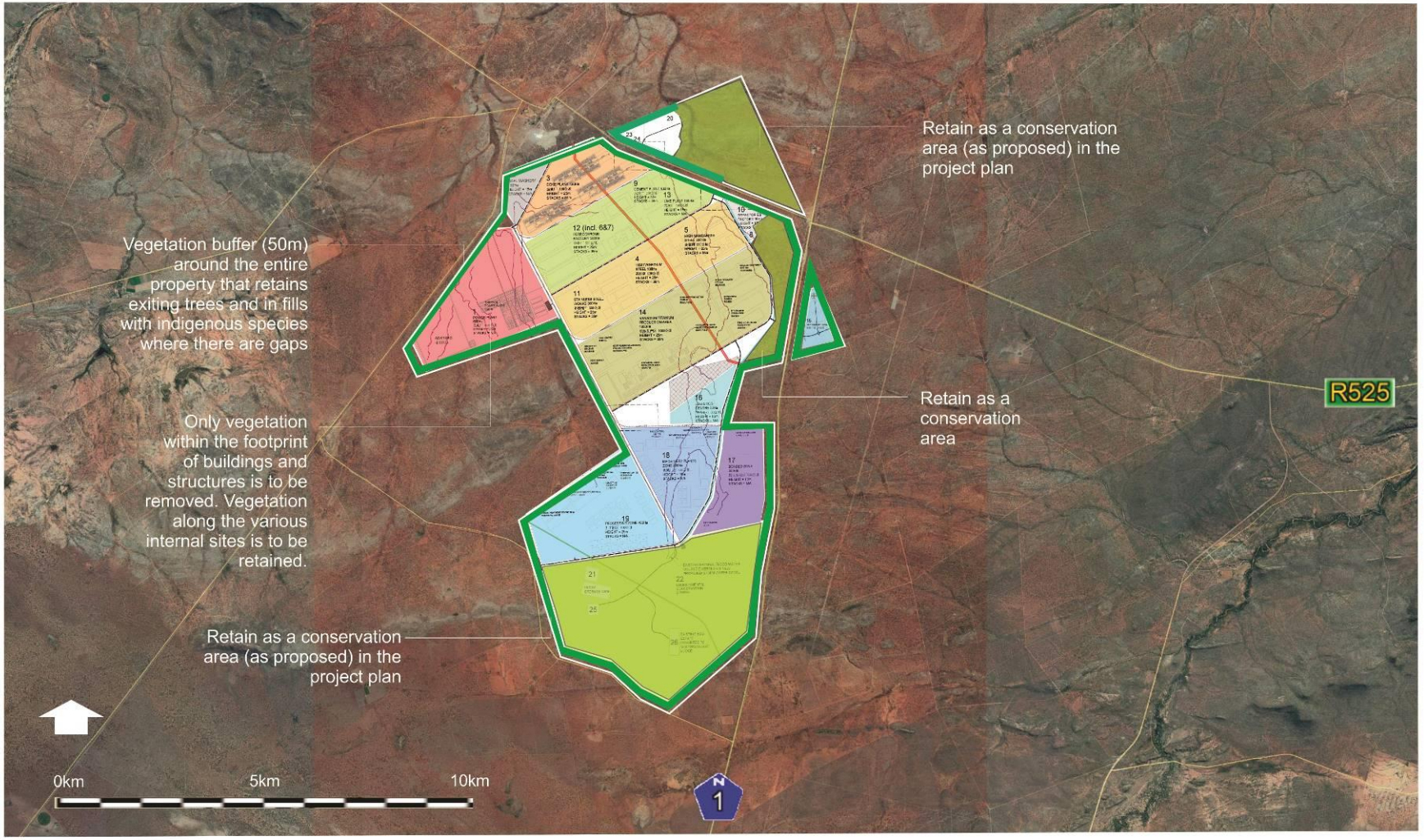


Figure 9: MITIGATION MEASURES - Musina Makhado SEZ

12. SIGNIFICANCE OF IMPACT

The following tables summarise the significance of the visual impact. These results are based on worst-case scenario (i.e. intensity of impact without mitigation on views from sensitive viewing areas, nearby farmsteads, game farms and the public roads) when the impacts of all aspects of the Project are taken together using the impact criteria in Appendix C. The *intensity* of impact, rated in Table 6, is further qualified with *duration*, *extent* and *probability* criteria to determine the *significance.* According to these criteria *significance* of impact is a function of (Intensity + Duration + Extent) x Probability[5]. At time of writing the construction period was not known. However, due to the nature and scale of the project it is expected that the construction period will take place over an extended period and therefore in rating the significance of impact, the timeframe of medium term, i.e. 5 – 15 years is considered.

Table 7: Significance of Visual Impact – *Construction Phase*

POTENTIAL VISUAL IMPACT	ENVIRONMENTAL SIGNIFICANCE						
	Management	Intensity	Duration	Extent	Probability	Significance	Status
Alteration to the visual quality of the study area due the removal of vegetation, topsoil the creation of 'terraces' to accommodate the various project components and the construction of structures and buildings. The result is degradation of the visual quality and sense of place of the study area. The Project will be visible to varying degrees from the local roads, N1, R525, Waterpoort Mopane road, surrounding farmsteads, and elevated areas located to the south and south-east of the Project site.	Without Mitigation	8	3	2	5	**65**	N
Mitigation measures are difficult during the construction phase and due to the nature of the activities the impact will not be significantly reduced.	With Mitigation*	8	3	2	4	**52**	N

[5] Significance Points = (Magnitude + Duration + Extent) x Probability. The maximum value is 100 Significance Points. Status: N = Negative P = Positive

Points	Significance Weighting	Description
< 30 points	**Low**	Where this impact would not have a direct influence on the decision to develop in the area
31-60 points	**Medium**	Where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	**High**	Where the impact must have an influence on the decision process to develop in the area

* This prediction assumes all mitigating measures implemented and are effectively managed at all times

Table 8: Significance of Visual Impact – *Operational Phase*

POTENTIAL VISUAL IMPACT	ENVIRONMENTAL SIGNIFICANCE						
	Management	Intensity	Duration	Extent	Probability	Significance	Status
Alteration to the visual quality of the study area due to the physical presence, scale and size of the Project and its associated infrastructure. The result is degradation of the visual quality and sense of place of the study area. The Project will be visible from the local roads, N1, R525, Waterpoort Mopane road, surrounding farmsteads, and elevated areas located to the south and south-east of the Project site. Refer to Figures 8-1, 8-2 and 8-3 for photo simulations.	Without Mitigation	10	5	2	4	**68**	N
Mitigation measures are difficult during the operational phase however if management measures are rigorously applied the impact will can be reduced during the operational phase.	With Mitigation*	8	4	2	4	**56**	N

* This prediction assumes all mitigating measures implemented and are effectively managed at all times

13. CUMULATIVE EFFECT

Cumulative landscape and visual effects (impacts) result from additional changes to the study area's landscape or visual amenity caused by the proposed Project in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future. They may also affect the way in which the landscape is experienced. Cumulative effects may be positive or negative. Where they comprise a range of benefits, they may be considered to form part of the mitigation measures. It the case of the Project, cumulative effects relate to the phasing of the SEZ project, the proposed Mutsho Power Station, immediately south of the Project power station, and a number of mines proposed in a north to west to east arc about the project site. The location of these and the Mutsho Power Station is illustrated in Figure 10.

13.1 Cumulative effect of the Project

The proposed Musina-Makhado SEZ project will be constructed / developed in phases and as each phase is constructed it will contribute to the *negative* impact on the landscape aesthetics of the area. This will result in a cumulative impact that would be equivalent to the significance of impact for the worst-case scenario as described in Section 12.

13.2 Cumulative of Future Planned Projects

Future cumulative effects will result from the mines and power project planned for the sub-region, many of which occur within the Project's study area. Refer to Figure 10. These projects are:

- Vele Project; is a proposed new mine located towards the north-west of Musina. The project falls outside the study area and is located approximately 30km from Musina.
- Generaal Project; is a proposed new coal mine located along the southern boundary of the Project site. The project stretches to the south and far east of the study area.
- Mopani Project; is a proposed new coal mine located along the north-western boundary of the Project site. The project stretches to the far north-west and west of the study area.
- Chapudi Project; is a proposed new coal mine located in the south-western corner of the study area.
- Makhado Project; is a proposed new coal mine located south and south-east of the Generaal Project.
- Mutsho Project; is a proposed new power plant located along the south-western boundary of the Project site.

Cumulative effects therefore arise from the intervisibility of the range of developments described above. The separate effects of these developments may not be of major significance in their own right, but together they may create an unacceptable degree of adverse effect on visual receptors within their combined visual envelopes. Intervisibility for these projects depends upon the study area's general topography, aspect and tree cover. The VAC for the study area is relatively high, but the combined effect over time would result in the entire study area being impacted upon in a significant manor. The potential result being a major lost and alteration to key elements and features of the visual resource baseline caused by the introduction of industrial and mining activities totally uncharacteristic with the pre-development landscape or view. High scenic quality impacts would result.

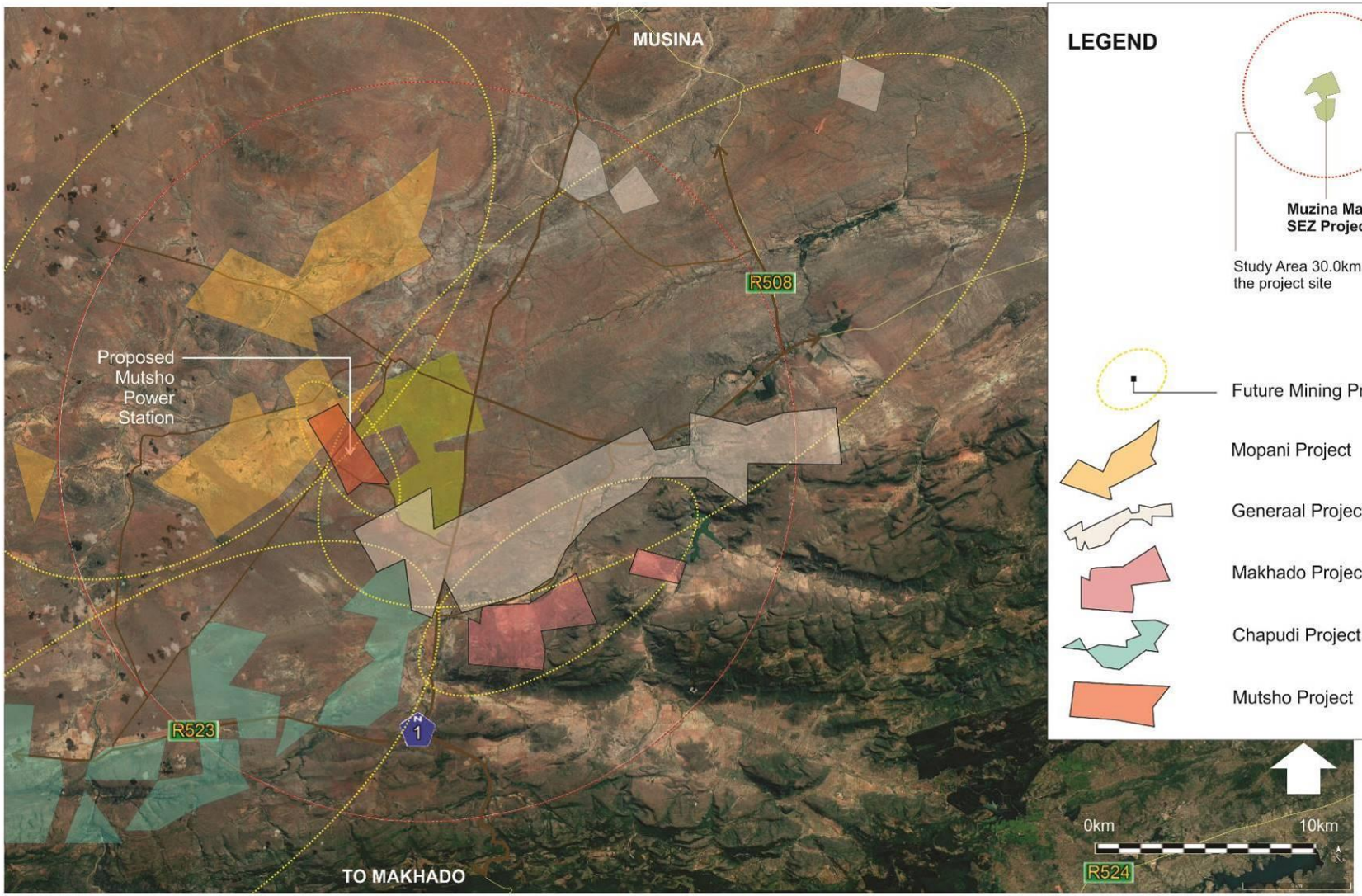


Figure 10: FUTURE CUMULATIVE IMPACTS - Musina Makhado SEZ

14. CONCLUSION

The existing visual condition of the landscape that may be affected by the proposed Project has been described. The study areas scenic quality has been rated *low* to *moderate* within the context of the sub-region and potential viewing areas and landscape types identified and mapped indicating potential sensitivity to the proposed development within a 30 km radius of the project site.

An overall rating within the context of the study area, of *low* to *high* is allocated to the study area. The lowest rating is associated with the existing mine located near Mopane and other power and rail infrastructure in the study area. A *high* rating is assigned to the Soutpansberg Mountain located in the southern section to the south of the study site, patches of Limpopo Ridge Bushveld and areas associated to the Sand River, located to the north of the Project site. A *moderate* rating is assigned to the Musina Mopane Bushveld which compromises the rest of the study area and most of the Project site.

Visual sensitivity towards the Project is expected to be high since the study area and project site are currently experienced as “natural” areas with very little man-made disturbances such as mining or industrial related activities. This is borne out when the public raised concerns during the Scoping phase (DeltaBEC 2019) regarding the visual impact. Specific concerns around the impact of the Project on the hunting and tourism indicates a sensitivity towards the Project as both these activities relate to the aesthetic (hunting to a lesser degree) attributes of the sub-region.

In determining the visibility of the Project the proposed heights of project components was used. Offsets equivalent to the proposed final heights of project components were used to generate viewsheds which indicated a high potential visibility of the Project. However, during the site investigation it became clear that existing tall vegetation and the flat to rolling topography, result in the landscape having a high VAC. The consequence being that most views to project activities would be blocked of partially blocked thus reducing significantly the intensity of visual impact on sensitive viewing areas. Only the very tall elements (i.e. the stacks), would protrude above the tree line.

The significance of visual impact (based on the worst-case scenario) of the proposed Project during both the construction and operational phases is predicted to be *high* for localized areas to the north and west of the project site as physical presence of the activities will cause a major loss of or alteration to key landscape elements and visual characteristics of the baseline. Targets, limits and thresholds of concern are likely to be regularly exceeded and intervention is required.

Mitigation is difficult due to the scale and bulk of Project activities. However, mitigation in both the construction and operational phases is possible, and can potentially reduce the impact in these phases from *high* (It must have an influence on the decision. Substantial mitigation will be required) to *moderate* (It should have an influence on the decision. Mitigation will be required). The study area has a high VAC due to the nature of the vegetation and the relative flatness of the topography. Mitigation must focus on retaining a

much existing vegetation as possible and ensuring that structures are designed to blend with the natural landscape to reduce contrast between new structures and their natural surroundings. All vegetation not inside a development footprint must be retained, along with a 50m (minimum) buffer zone along the Project boundary.

The report's findings confirm that localized high visual impacts would occur by residents and other sensitive receptors, living in and visiting areas immediately north of the R525, west and south west of the project site. It likely that the Project would compromise existing uses (primarily tourism and game farming) in the study area and it is therefore recommended that discussions are undertaken with local landowners who would be affected by the project. A small number of homesteads located on elevated positions south of the site could experience open views of the Project site, which is of particular concern.

It is the opinion of the author that all aspects of the Project, from a potential visual impact perspective, should be approved provided that the mitigation/management measures are strictly adhered to and effectively implemented, managed and monitored in the long term.

****NLA****

15. REFERENCES - BIBLIOGRAPHY

Amir, S. & Gidalizon, E. 1990. Expert-based method for the evaluation of visual absorption capacity of the landscape. *Journal of Environmental Management.* Vol. 30, Issue 3: 251 – 263.

Crawford, D., 1994. Using remotely sensed data in landscape visual quality assessment. *Landscape and Urban Planning.* 30: 71-81.

Hull, R.B. & Bishop, I.E., 1988. Scenic Impacts of Electricity Transmission Towers: The Influence of Landscape Type and Observer Distance. *Journal of Environmental Management.* 27: 99-108.

Institute of Environmental Assessment & The Landscape Institute, 1996. *Guidelines for Landscape and Visual Impact Assessment,* E & FN Spon, London (117)

Ittelson, W.H., Proshansky, H.M., Rivlin, L.G. and Winkel, G.H., 1974. *An Introduction to Environmental Psychology.* Holt, Rinehart and Winston, New York.

Lange, E., 1994. Integration of computerized visual simulation and visual assessment in environmental planning. *Landscape and Environmental Planning.* 30: 99-112.

Landscape Institute – Institute of Environmental Management and Assessment (LI-IEMA), 2013. *Guidelines for Landscape & Visual Impact Assessment*. 3rd Edition, Routledge, London.

Lynch, K., 1992. *Good City Form*, The MIT Press, London. (131)

Mucina, L. & Rutherford, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia 19*. South African National Biodiversity Institute, Pretoria.

Oberholzer, B., 2005. Guideline for involving visual & 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 & Development Planning, Cape Town.

Ramsay, J. (October 1993), Identification and assessment of aesthetic values in two Victorian forest regions. *More than meets the eye: identifying and assessing aesthetic value.* Report of the Aesthetic Value Workshop held at the University of Melbourne.

Sama, J. (2000), Program Policy, *Assessing and Mitigating Visual Impact,* Department of Environmental Conservation. New York.

Schapper, J. (October 1993), The importance of aesthetic value in the assessment of landscape heritage. *More than meets the eye: identifying and assessing aesthetic value.* Report of the Aesthetic Value Workshop held at the University of Melbourne.

Walmsley, B., & Tshipala, K. E. (2007). Handbook on Environmental Assessment Legislation in the SADC Region. Midrand: The Development Bank of South Africa in collaboration with the South African Institute for Environmental Assessment.

Warnock, S. & Brown, N., 1998. Putting Landscape First. *Landscape Design.* 268: 44-46.

To reach an understanding of the effect of development on a landscape resource, it is necessary to consider the different aspects of the landscape as follows:

Landscape Elements and Character

The individual elements that make up the landscape, including prominent or eye-catching features such as hills, valleys, savannah, trees, water bodies, buildings and roads are generally quantifiable and can be easily described.

Landscape character is therefore the description of pattern, resulting from particular combinations of natural (physical and biological) and cultural (land use) factors and how people perceive these. The visual dimension of the landscape is a reflection of the way in which these factors create repetitive groupings and interact to create areas that have a specific visual identity. The process of landscape character assessment can increase appreciation of what makes the landscape distinctive and what is important about an area. The description of landscape character thus focuses on the *nature of the land*, rather than the response of a viewer.

Landscape Value – all encompassing (Aesthetic Value)

Aesthetic value is the emotional response derived from the experience of the environment with its particular natural and cultural attributes. The response can be either to visual or non-visual elements and can embrace sound, smell and any other factor having a strong impact on human thoughts, feelings and attitudes (Ramsay 1993). Thus, aesthetic value encompasses more than the seen view, visual quality or scenery, and includes atmosphere, landscape character and sense of place (Schapper 1993).

Aesthetic appeal (value) is considered high when the following are present (Ramsay 1993):

- *Abstract qualities*: such as the presence of vivid, distinguished, uncommon or rare features or abstract attributes;
- *Evocative responses*: the ability of the landscape to evoke particularly strong responses in community members or visitors;
- *Meanings*: the existence of a long-standing special meaning to a particular group of people or the ability of the landscape to convey special meanings to viewers in general;
- *Landmark quality*: a particular feature that stands out and is recognised by the broader community.

Sense of Place

Central to the concept of a sense of place is that the place requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape together with the cultural transformations and traditions associated with historic use and habitation. According to Lynch (1992) sense of place "is the extent to which a person can recognize or recall a place as being distinct from other places - as having a vivid, or unique, or at least particular, character of its own". Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. In some cases, these values allocated to the place are similar for a wide spectrum of users or viewers, giving the place a universally recognized and therefore, strong sense of place.

Scenic Quality

Assigning values to visual resources is a subjective process. The phrase, “beauty is in the eye of the beholder,” is often quoted to emphasize the subjectivity in determining scenic values. Yet, researchers have

found consistent levels of agreement among individuals asked to evaluate visual quality.

Studies for perceptual psychology have shown human preference for landscapes with a higher visual complexity particularly in scenes with water, over homogeneous areas. On the basis of contemporary research landscape quality increases when:

- Topographic ruggedness and relative relief increase;
- Where water forms are present;
- Where diverse patterns of grasslands and trees occur;
- Where natural landscape increases and man-made landscape decreases;
- And where land use compatibility increases and land use edge diversity decreases (Crawford 1994).

Scenic Quality - Explanation of Rating Criteria:

(After The Visual Resource Management System, Department of the Interior of the USA Government, Bureau of Land Management)

Landform: Topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured. Outstanding landforms may be monumental, as the Fish River or Blyde River Canyon, the Drakensberg or other mountain ranges, or they may be exceedingly artistic and subtle as certain pinnacles, arches, and other extraordinary formations.

Vegetation: (Plant communities) Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular (wildflower displays in the Karoo regions). Consider also smaller scale vegetational features, which add striking and intriguing detail elements to the landscape (e.g., gnarled or wind beaten trees, and baobab trees).

Water: That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration in selecting the rating score.

Colour: Consider the overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) as they appear during seasons or periods of high use. Key factors to use when rating "colour" are variety, contrast, and harmony.

Adjacent Scenery: Degree to which scenery outside the scenery unit being rated enhances the overall impression of the scenery within the rating unit. The distance which adjacent scenery will influence scenery within the rating unit will normally range from 0-8 kilometres, depending upon the characteristics of the topography, the vegetative cover, and other such factors. This factor is generally applied to units which would normally rate very low in score, but the influence of the adjacent unit would enhance the visual quality and raise the score.

Scarcity: This factor provides an opportunity to give added importance to one or all of the scenic features that appear to be relatively unique or rare within one physiographic region. There may also be cases where a separate evaluation of each of the key factors does not give a true picture of the overall scenic quality of an area. Often it is a number of not so spectacular elements in the proper combination that produces the most pleasing and memorable scenery - the scarcity factor can be used to recognize this type of area and give it the added emphasis it needs.

Cultural Modifications: Cultural modifications in the landform / water, vegetation, and addition of structures should be considered and may detract from the scenery in the form of a negative intrusion or complement or improve the scenic quality of a unit.

Scenic Quality Inventory and Evaluation Chart

(After The Visual Resource Management System, Department of the Interior of the USA Government, Bureau of Land Management)

Key factors	Rating Criteria and Score		
Landform	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops, or severe surface variation or highly eroded formations including major badlands or dune systems; or detail features dominant and exceptionally striking and intriguing such as glaciers. **5**	Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting erosional patterns or variety in size and shape of landforms; or detail features which are interesting though not dominant or exceptional. **3**	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features. **1**
Vegetation and landcover	A variety of vegetative types as expressed in interesting forms, textures, and patterns. **5**	Some variety of vegetation, but only one or two major types. **3**	Little or no variety or contrast in vegetation. **1**
Water	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. **5**	Flowing, or still, but not dominant in the landscape. **3**	Absent, or present, but not noticeable. **0**
Colour	Rich colour combinations, variety or vivid colour; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. **5**	Some intensity or variety in colours and contrast of the soil, rock and vegetation, but not a dominant scenic element. **3**	Subtle colour variations, contrast, or interest; generally mute tones. **1**
Influence of adjacent scenery	Adjacent scenery greatly enhances visual quality. **5**	Adjacent scenery moderately enhances overall visual quality. **3**	Adjacent scenery has little or no influence on overall visual quality. **0**
Scarcity	One of a kind; or unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. National and provincial parks and conservation	Distinctive, though somewhat similar to others within the region.	Interesting within its setting, but fairly common within the region.

	areas *** 5+**	**3**	**1**
Cultural modifications	Modifications add favourably to visual variety while promoting visual harmony. **2**	Modifications add little or no visual variety to the area, and introduce no discordant elements. **0**	Modifications add variety but are very discordant and promote strong disharmony. **4**

Scenic Quality (i.e. value of the visual resource)

In determining the quality of the visual resource both the objective and the subjective or aesthetic factors associated with the landscape are considered. Many landscapes can be said to have a strong sense of place, regardless of whether they are considered to be scenically beautiful but where landscape quality, aesthetic value and a strong sense of place coincide - the visual resource or perceived value of the landscape is considered to be very high.

When considering both objective and subjective factors associated with the landscape there is a balance between landscape character and individual landscape features and elements, which would result in the values as follows:

Value of Visual Resource – expressed as Scenic Quality
(After The Landscape Institute with the Institute of Environmental Management and Assessment (2002))

High	Moderate	Low
Areas that exhibit a very positive character with valued features that combine to give the experience of unity, richness and harmony. These are landscapes that may be of particular importance to conserve and which may be sensitive change in general and which may be detrimental if change is inappropriately dealt with.	Areas that exhibit positive character but which may have evidence of alteration to /degradation/erosion of features resulting in areas of more mixed character. Potentially sensitive to change in general; again change may be detrimental if inappropriately dealt with but it may not require special or particular attention to detail.	Areas generally negative in character with few, if any, valued features. Scope for positive enhancement frequently occurs.

A visual impact study analysis addresses the importance of the inherent aesthetics of the landscape, the public value of viewing the natural landscape, and the contrast or change in the landscape from the project.

For some topics, such as water or air quality, it is possible to use measurable, technical international or national guidelines or legislative standards, against which potential effects can be assessed. The assessment of likely effects on a landscape resource and on visual amenity is more complex, since it is determined through a combination of quantitative and qualitative evaluations. (The Landscape Institute with the Institute of Environmental Management and Assessment (2002).

Landscape impact assessment includes a combination of objective and subjective judgements, and it is therefore important that a structured and consistent approach is used. It is necessary to differentiate between judgements that involve a degree of subjective opinion (as in the assessment of landscape value) from those that are normally more objective and quantifiable (as in the determination of magnitude of change). Judgement should always be based on training and experience and be supported by clear evidence and reasoned argument. Accordingly, suitably qualified and experienced landscape professionals carry out landscape and visual impact assessments (The Landscape Institute with the Institute of Environmental Management and Assessment (2002),

Landscape and visual assessments are separate, although linked, procedures. The landscape baseline, its analysis and the assessment of landscape effects all contribute to the baseline for visual assessment studies. The assessment of the potential effect on the landscape is carried our as an effect on an environmental resource, i.e. the landscape. Visual effects are assessed as one of the interrelated effects on population.

Landscape Impact

Landscape impacts derive from changes in the physical landscape, which may give rise to changes in its character and from effects to the scenic values of the landscape. This may in turn affect the perceived value ascribed to the landscape. The description and analysis of effects on a landscape resource relies on the adoption of certain basic principles about the positive (or beneficial) and negative (or adverse) effects of change in the landscape. Due to the inherently dynamic nature of the landscape, change arising from a development may not necessarily be significant (Institute of Environmental Assessment & The Landscape Institute (2002)).

Visual Impact

Visual impacts relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity. Visual impact is therefore measured as the change to the existing visual environment (caused by the physical presence of a new development) and the extent to which that change compromises (negative impact) or enhances (positive impact) or maintains the visual quality of the area.

To assess the magnitude of visual impact four main factors are considered.

Visual Intrusion:	The nature of intrusion or contrast (physical characteristics) of a project component on the visual quality of the surrounding environment and its compatibility/discord with the landscape and surrounding land use.
Visibility:	The area/points from which project components will be visible.
Visual exposure:	Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion.
Sensitivity:	Sensitivity of visual receptors to the proposed development

Visual Intrusion / contrast

Visual intrusion deals with the notion of contextualism i.e. how well does a project component fit into the ecological and cultural aesthetic of the landscape as a whole? Or conversely what is its contrast with the receiving environment. Combining landform / vegetation contrast with structure contrast derives overall visual intrusion/contrast levels of high, moderate, and low.

Landform / vegetation contrast is the change in vegetation cover and patterns that would result from construction activities. Landform contrast is the change in landforms, exposure of soils, potential for erosion scars, slumping, and other physical disturbances that would be noticed as uncharacteristic in the natural landscape. Structure contrast examines the compatibility of the proposed development with other structures in the landscape and the existing natural landscape. Structure contrast is typically strongest where there are no other structures (e.g., buildings, existing utilities) in the landscape setting.

Photographic panoramas from key viewpoints before and after development are presented to illustrate the nature and change (contrast) to the landscape created by the proposed development. A computer simulation technique is employed to superimpose a graphic of the development onto the panorama. The extent to which the component fits or contrasts with the landscape setting can then be assessed using the following criteria.

- Does the physical development concept have a negative, positive or neutral effect on the quality of the landscape?
- Does the development enhance or contrast with the patterns or elements that define the structure of the landscape?
- Does the design of the project enhance and promote cultural continuity or does it disrupt it?

The consequence of the intrusion / contrast can then be measured in terms of the sensitivity of the affected landscape and visual resource given the criteria listed below. For instance, within an industrial area, a new sewage treatment works may have an insignificant landscape and visual impact; whereas in a *valued* landscape it might be considered to be an intrusive element. (Institute of Environmental Assessment & The landscape Institute (1996)).

Visual Intrusion

High	Moderate	Low	Positive
If the project: - Has a substantial negative effect on the visual quality of the landscape; - Contrasts dramatically with the patterns or elements that define the structure of the landscape; - Contrasts dramatically with land use, settlement or enclosure patterns; - Is unable to be 'absorbed' into the landscape.	If the project: - Has a moderate negative effect on the visual quality of the landscape; - Contrasts moderately with the patterns or elements that define the structure of the landscape; - Is partially compatible with land use, settlement or enclosure patterns. - Is partially 'absorbed' into the landscape.	If the project: - Has a minimal effect on the visual quality of the landscape; - Contrasts minimally with the patterns or elements that define the structure of the landscape; - Is mostly compatible with land use, settlement or enclosure patterns. - Is 'absorbed' into the landscape.	If the project: - Has a beneficial effect on the visual quality of the landscape; - Enhances the patterns or elements that define the structure of the landscape; - Is compatible with land use, settlement or enclosure patterns.

Result Notable change in landscape characteristics over an extensive area and/or intensive change over a localized area resulting in major changes in key views.	*Result* Moderate change in landscape characteristics over localized area resulting in a moderate change to key views.	*Result* Imperceptible change resulting in a minor change to key views.	*Result* Positive change in key views.

Visual intrusion also diminishes with scenes of higher complexity, as distance increases, the object becomes less of a focal point (more visual distraction), and the observer's attention is diverted by the complexity of the scene (Hull and Bishop (1988)).

Visibility

A viewshed analysis was carried out to define areas, which contain all possible observation sites from which the development would be visible. The basic assumption for preparing a viewshed analysis is that the observer eye height is 1.8m above ground level. Topographic data was captured for the site and its environs at 10 m contour intervals to create the Digital Terrain Model (DTM). The DTM includes features such as vegetation, rivers, roads and nearby urban areas. These features were 'draped' over the topographic data to complete the model used to generate the viewshed analysis. It should be noted that viewshed analyses are not absolute indicators of the level of significance (magnitude) of the impact in the view, but merely a statement of the fact of potential visibility. The visibility of a development and its contribution to visual impact is predicted using the criteria listed below:

Visibility

High	Moderate	Low
Visual Receptors If the development is visible from over half the zone of potential influence, and/or views are mostly unobstructed and/or the majority of viewers are affected.	*Visual Receptors* If the development is visible from less than half the zone of potential influence, and/or views are partially obstructed and or many viewers are affected	*Visual Receptors* If the development is visible from less than a quarter of the zone of potential influence, and/or views are mostly obstructed and/or few viewers are affected.

Visual Exposure

Visual exposure relates directly to the distance of the view. It is a criterion used to account for the limiting effect of increased distance on visual impact. The impact of an object in the foreground (0 – 800m) is greater than the impact of that same object in the middle ground (800m – 5.0 km) which, in turn is greater than the impact of the object in the background (greater than 5.0 km) of a particular scene.

Distance from a viewer to a viewed object or area of the landscape influences how visual changes are perceived in the landscape. Generally, changes in form, line, colour, and texture in the landscape become less perceptible with increasing distance.

Areas seen from 0 to 800m are considered foreground; foliage and fine textural details of vegetation are normally perceptible within this zone.

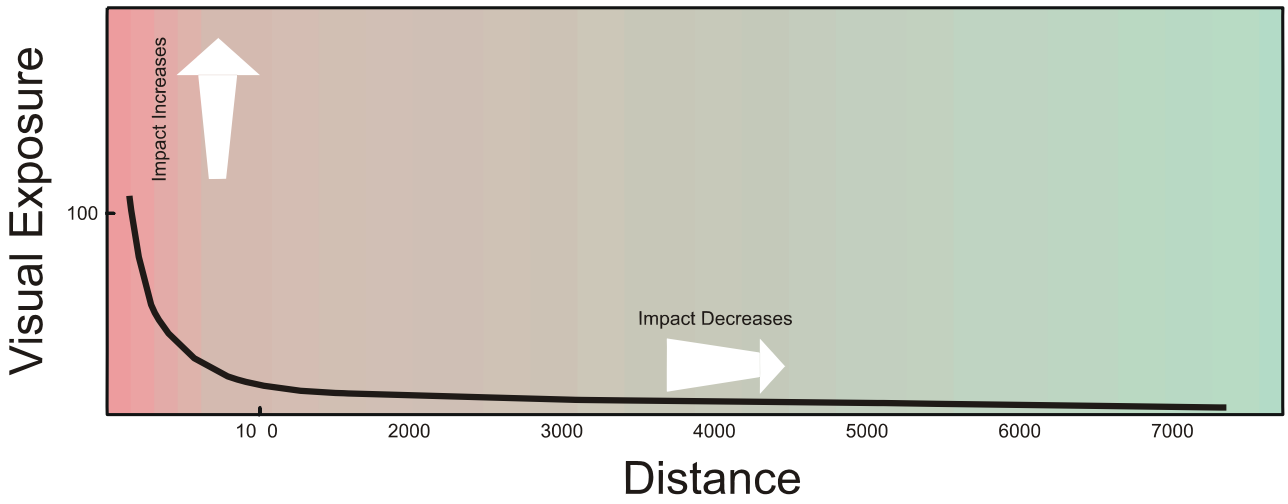
Areas seen from 800m to 5.0km are considered middle ground; vegetation appears as outlines or patterns. Depending on topography and vegetation, middle ground is sometimes considered to be up to 8.0km.

Areas seen from 5.0km to 8.0km and sometimes up to 16km and beyond are considered background. Landforms become the most dominant element at these distances.

Seldom seen areas are those portions of the landscape that, due to topographic relief or vegetation, are screened from the viewpoint or are beyond 16km from the viewpoint. Landforms become the most dominant element at these distances.

The impact of an object diminishes at an exponential rate as the distance between the observer and the object increases. Thus, the visual impact at 1000 m would be 25% of the impact as viewed from 500 m. At 2000 m it would be 10% of the impact at 500 m. The inverse relationship of distance and visual impact is well recognised in visual analysis literature (e.g.: Hull and Bishop (1988)) and is used as an important criteria for the study. This principle is illustrated in the Figures below.

Effect of Distance on Visual Exposure



View from 10 000 metres

View from 5 000 metres

View from 3 000 metres

View from 1 000 metres

Sensitivity of Visual Receptors

When visual intrusion, visibility and visual exposure are incorporated, and qualified by sensitivity criteria (visual receptors) the magnitude of the impact of the development can be determined.

The sensitivity of visual receptors and views will be depended on:

- The location and context of the viewpoint;
- The expectations and occupation or activity of the receptor;
- The importance of the view (which may be determined with respect to is popularity or numbers of people affected, its appearance in guidebooks, on tourist maps, and in the facilities provided for its enjoyment and references to it in literature or art).

The most sensitive receptors may include:

- Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape;
- Communities where the development results in changes in the landscape setting or valued views enjoyed by the community;
- Occupiers of residential properties with views affected by the development.
- These would all be high

Other receptors include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value);
- People travelling through or past the affected landscape in cars, on trains or other transport routes;
- People at their place of work.

The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view.

In this process more weight is usually given to changes in the view or visual amenity which are greater in scale, and visible over a wide area. In assessing the effect on views, consideration should be given to the effectiveness of mitigation measures, particularly where planting is proposed for screening purposes (Institute of Environmental Assessment & The Landscape Institute (1996).

Sensitivity of Visual Receptors

High	Moderate	Low
Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape;	People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value);	The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view (i.e. office and industrial areas).
Communities where the development results in changes in the landscape setting or valued views enjoyed by the community;	People travelling through or past the affected landscape in cars, on trains or other transport routes;	Roads going through urban and

Occupiers of residential properties with views affected by the development.	industrial areas

Intensity of the Visual Impact

Potential visual impacts are determined by analysing how the physical change in the landscape, resulting from the introduction of a project, are viewed and perceived from sensitive viewpoints. Impacts to views are the highest when viewers are identified as being sensitive to change in the landscape, and their views are focused on and dominated by the change. Visual impacts occur when changes in the landscape are noticeable to viewers looking at the landscape from their homes or from parks, and conservation areas, highways and travel routes, and important cultural features and historic sites, especially in foreground views.

The magnitude of impact is assessed through a synthesis of visual intrusion, visibility, visual exposure and viewer sensitivity criteria. Once the magnitude of impact has been established this value is further qualified with spatial, duration and probability criteria to determine the *significance* of the visual impact.

For instance, the fact that visual intrusion and exposure diminishes significantly with distance does not necessarily imply that the relatively small impact that exists at greater distances is unimportant. The level of impact that people consider acceptable may be dependent upon the purpose they have in viewing the landscape. A particular development may be unacceptable to a hiker seeking a natural experience, or a household whose view is impaired, but may be barely noticed by a golfer concentrating on his game or a commuter trying to get to work on time (Ittleson *et al.,* 1974).

In synthesising these criteria a numerical or weighting system is avoided. Attempting to attach a precise numerical value to qualitative resources is rarely successful, and should not be used as a substitute for reasoned professional judgement. (Institute of Environmental Assessment and The landscape Institute (1996)).

Intensity (Intensity) of Visual Impact

High	Moderate	Low	Negligible
Total loss of or major alteration to key elements/features/characteristics of the baseline.	Partial loss of or alteration to key elements/features/characteristics of the baseline.	Minor loss of or alteration to key elements/features/characteristics of the baseline.	Very minor loss or alteration to key elements/features/characteristics of the baseline.
I.e. Pre-development landscape or view and/or introduction of elements considered to be totally uncharacteristic when set within the attributes of the receiving landscape.	I.e. Pre-development landscape or view and/or introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes of the receiving	I.e. Pre-development landscape or view an/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape.	I.e. Pre-development landscape or view and/or introduction of elements that are not uncharacteristic with the surrounding landscape – approximating the 'no change' situation.

	landscape.		
High scenic quality impacts would result.	Moderate scenic quality impacts would result	Low scenic quality impacts would result.	Negligible scenic quality impacts would result.

Cumulative effects

Cumulative landscape and visual effects (impacts) result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future. They may also affect the way in which the landscape is experienced. Cumulative effects may be positive or negative. Where they comprise a range of benefits, they may be considered to form part of the mitigation measures.

Cumulative effects can also arise from the intervisibility (visibility) of a range of developments and /or the combined effects of individual components of the proposed development occurring in different locations or over a period of time. The separate effects of such individual components or developments may not be significant, but together they may create an unacceptable degree of adverse effect on visual receptors within their combined visual envelopes. Intervisibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation and distance, as this affects visual acuity, which is also influenced by weather and light conditions. (Institute of Environmental Assessment and The landscape Institute (1996)).

APPENDIX C: CRITERIA FOR SIGNIFICANCE OF IMPACT ASSESSMENT

The methods and formulae are largely based on DEAT's (1998) Guideline Document: EIA Regulations. Environmental issues and potential impacts will be assessed using recognised qualitative impact assessment methodology. The objective of the assessment of impacts is to identify and assess all the significant impacts that may arise as a result of the proposed upgrading of the road. The process of assessing the impacts of the project encompasses the following four activities:

- Identification and assessment of potential impacts
- Prediction of the nature, magnitude, extent and duration of potentially significant impacts
- Identification of mitigation measures that could be implemented to reduce the severity or significance of the impacts of the activity
- Evaluation of the significance of the impact after the mitigation measures have been implemented i.e. the significance of the residual impact.

Impacts are assessed in terms of the following criteria:

<table>
<tr><th>Criteria</th><th>Indicator</th></tr>
<tr><td>The nature</td><td>A description of what causes the effect, what will be affected and how it will be affected</td></tr>
<tr><td>The physical extent</td><td>Wherein it is indicated whether:

<table><tr><td>1.</td><td>The impact will be limited to the site</td></tr><tr><td>2.</td><td>The impact will be limited to the local area extending far beyond the site boundary</td></tr><tr><td>3.</td><td>The impact will be limited to the region</td></tr><tr><td>4.</td><td>The impact will be national</td></tr><tr><td>5.</td><td>The impact will be international</td></tr></table></td></tr>
<tr><td>The duration</td><td>Wherein it is indicated whether the lifetime of the impact will be of:

<table><tr><td>1</td><td>A very short duration (0–1 years)</td></tr><tr><td>2</td><td>A short duration (2-5 years)</td></tr><tr><td>3</td><td>Medium-term (5–15 years)</td></tr><tr><td>4</td><td>Long term (> 15 years)</td></tr><tr><td>5</td><td>Permanent</td></tr></table></td></tr>
<tr><td>The magnitude of impact on ecological processes</td><td>Impacts quantified on a scale from 0-10, where a score is assigned:

<table><tr><td>0</td><td>Small and will have no effect on the environment</td></tr><tr><td>2</td><td>Minor and will not result in an impact on processes</td></tr><tr><td>4</td><td>Low and will cause a slight impact on processes</td></tr><tr><td>6</td><td>Moderate and will result in processes continuing but in a modified way</td></tr><tr><td>8</td><td>High (processes are altered to the extent that they temporarily cease)</td></tr><tr><td>10</td><td>Very high and results in complete destruction of patterns and permanent cessation of processes</td></tr></table></td></tr>
</table>

The probability of occurrence/ likelihood of the impact actually occurring	Probability is estimated on a scale where: 1 Very improbable (probably will not happen) 2 Improbable (some possibility, but low likelihood) 3 Probable (distinct possibility) 4 Highly probable (most likely) 5 Definite (impact will occur regardless of any prevention measures)

Significance is assessed in terms of:

- The significance, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high
- The status, which is described as either positive, negative or neutral
- The degree to which the impact can be reversed
- The degree to which the impact may cause irreplaceable loss of resources
- The degree to which the impact can be mitigated

The significance is determined by combining the criteria in the following formula:

Significance Points = (Magnitude + Duration + Extent) x Probability. The maximum value is 100 Significance Points.

The significance weightings for each potential impact are outlined in the table below

Points	Significance Weighting	Description
< 30 points	**Low**	Where this impact would not have a direct influence on the decision to develop in the area
31-60 points	**Medium**	Where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	**High**	Where the impact must have an influence on the decision process to develop in the area

APPENDIX D: CRITERIA FOR PHOTO / COMPUTER SIMULATION

To characterize the nature and magnitude of visual intrusion of the proposed project, a photographic simulation technique was used. This method was used according to Sheppard (in Lange 1994), where a visual simulation is good quality when the following five criteria are met.

Representativeness:	A simulation should represent important and typical views of a project.
Accuracy:	The similarity between a simulation and the reality after the project has been realized.
Visual clarity:	Detail, parts and overall contents have to be clearly recognizable.
Interest:	A simulation should hold the attention of the viewer.
Legitimacy:	A simulation is defensible if it can be shown how it was produced and to what degree it is accurate.

To comply with this standard it was decided to produce a stationary or static simulation (Van Dortmont in Lange, 1994), which shows the proposed development from a typical static observation points (Critical View Points).

Photographs are taken on site during a site visit with a manual focus, 50mm focal depth digital camera. All camera settings are recorded and the position of each panoramic view is recorded by means of a GPS. These positions, coordinates are then placed on the virtual landscape (see below).

A scale model of the proposal is built in virtual space, scale 1:1, based on CAD (vector) information as supplied by the architect / designers. This model is then placed on a virtual landscape, scale 1:1, as produced by means of GIS software. The accuracy of this depends on the contour intervals.

The camera views are placed on the points as recorded on the virtual landscape. The respective photographs are overlaid onto the camera views, and the orientation of the cameras adjusted accordingly. The light source is adjusted to suit the view. Each view is then rendered as per the process above.

Graham Young PrLArch FILASA

PO Box 331, Groenkloof, 0027
Tel: +27 0(82) 462 1491
grahamyounglandarch@gmail.com

Visual Impact Assessments

Graham is a registered landscape architect with interest and experience in landscape architecture, urban design and environmental planning. He holds a degree in landscape architecture from the University of Toronto and has practiced in Canada and Africa, where he has spent most of his working life. He has served as President of the Institute of Landscape Architects of South Africa (ILASA) and as Vice President of the Board of Control for Landscape Architects.

During his 40 years plus career he has received numerous ILASA and other industry awards. He has published widely on landscape architectural issues and has had projects published both locally and internationally in, scientific and design journals and books. He was a being a founding member of Newtown Landscape Architects and is also a senior lecturer, teaching landscape architecture and urban design at post and under graduate levels, at the University of Pretoria. He has been a visiting studio critic at the University of Witwatersrand and University of Cape Town and in 2011 was invited to the University of Rhode Island, USA as their Distinguished International Scholar for that year. Recently, Graham resigned from NLA and now practices as a Sole Proprietor although he acts as an associate and collaborates on visual impact assessment work.

A niche specialty of his is Visual Impact Assessment for which he was cited with an ILASA Merit Award in 1999. He has completed over 250 specialist reports for projects in South Africa, Canada and other African countries. He was on the panel that developed the *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes* (2005) and produced a research document for Eskom, *The Visual Impacts of Power Lines* (2009). In 2011, he produced '*Guidelines for involving visual and aesthetic specialists'* for the Aapravasi Ghat Trust Fund Technical Committee (they manage a World Heritage Site) along with the *Visual Impact Assessment Training Module Guideline Document.*

*** NLA ***