FINAL

Visual Impact Assessment

TSHIPI MINE
ALTERNATIVE CLOSURE AND REHABILITATION PROJECT

TSHIPI MINE ALTERNATIVE CLOSURE AND REHABILITATION PROJECT

NORTHERN CAPE PROVINCE

Submitted to:

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Date Issued:	09 July 2019
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Reviewed By:	Graham Young PrLArch, FILASA
Reference:	032_2019: Tshipi Mine Alternative Closure and Rehabilitation Project, Northern Cape Province

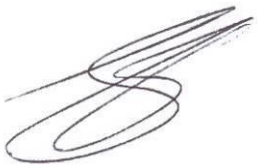
EXPERTISE OF SPECIALIST

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 Tshipi EMP3 Closure Plan 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

20 May 2019

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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
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 10.1
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 3 and 5
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;	Section 10
Any mitigation measures for inclusion in the EMPr;	Section 10
Any conditions for inclusion in the environmental authorisation	Section 11
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 11
A reasoned opinion whether the proposed activity, activities or portions thereof should be authorised regarding the acceptability	Section 12

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 12
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.	N/A

ACRONYMS, ABBREVIATIONS & GLOSSARY

Acronyms & Abbreviations	
BAR	Basic Assessment Report
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GYLA	Graham A Young Landscape Architect
SACLAP	South African Council for the Landscape Architectural Profession
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 'zone of potential influence' (the area defined as the radius about the centre point of the project beyond which the visual impact of the most visible features will be insignificant) which is a 10,0km radius surrounding the proposed project footprint / site.
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 would be visible. The basic assumption for preparing a viewshed analysis is that the observer eye height is 1,8m above ground level.
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 views 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 be insignificant primarily due to distance.

EXECUTIVE SUMMARY

Graham A Young Landscape Architect (GYLA) was commissioned by SLR Consulting (South Africa) (Pty) Ltd to carry out a Visual Impact Assessment (VIA) of the Tshipi Mine Alternative Closure and Rehabilitation Project, Northern Cape ("the Project"). The VIA focuses on the physical aspects of the preferred Option 3 of the Project at closure, within its local landscape context.

Project Site and Study area

The project site is located on the Tshipi Borwa Mine (an existing mine) property, to the immediate west of the Mamatwan Manganese mine and south of the United Manganese of the Kalahari (UMK) mine, approximately 40km north of Kathu immediately west of the R380 road. The study area comprises a visual envelope of 10,0km around the site. It includes the site itself and the full extent of the wider landscape around it, which the proposed Project may influence in a significant manner. Beyond this distance the scale and bulk project components will recede dramatically into the background of views[1] and have little effect on visual impact. The determination of the extent of the study area is therefore based on observations during the site visit, and taking, topography, aspect, vegetation, and structures into account.

Aim of the Specialist Study

The aim of the study is to ensure that the visual consequences of the Project are understood and adequately considered in the Environmental Impact Assessment (EIA) process in terms of Appendix 6 of the EIA Regulations 2014.

Assumption, Uncertainties and Limitations

The following assumptions limitations have been made in the study:

- The extent of the study area is determined by the zone of potential influence, which in this study relates to a radius of 10,0km around the Project site. At 10,0km and beyond the Project would recede into background views and or be screened by existing vegetation, mining operations or infrastructure, primarily due to distance from the viewer and the flat topography;
- The description of project components is limited to what has been supplied to the author prior to the date of completion of this report;
- No alternatives to the Project layout and site have been proposed – only the preferred option at closure has been assessed.

Alternatives

Four alternative closure options were considered in a preliminary options analysis (SLR 2019). These are:

- Option 1: Complete Backfill – backfill of the final pit void post mining to original ground level, before rehabilitation of the surface as per the current approved EMPr

[1] This is based on observations made during the site visit where existing waste rock dumps (approximately 60m in height) could barely be seen from distances greater that 10km due to the presence of savanna vegetation on a flat topography i.e. the trees tended to screen views to the site.

- Option 2: Partial Backfill – backfill of the final pit void post mining to a level just above the rebound water-table level, approximately 50m below original ground level, before rehabilitation of the surface.
- Option 3: Concurrent Backfill (in-pit) dumping - backfill of the pit void concurrent with mining only, also called in-pit dumping, which results in a final pit void which will be 'made safe' (profiled) before rehabilitation of the surface.
- Option 4: No Backfill - No backfill of the pit either concurrent with mining or post mining i.e. all waste rock to surface dumps. The pit side-walls and end-walls will only be 'made safe'

Comparison between Option 1 and 3

The approved EMPr commits Tshipi Mine to restore the surface to pre-mining state of wilderness and grazing and requires that the open pit is backfilled. This is Option 1 which entails a complete backfill of the final pit void post mining before rehabilitation of the surface can take place. However, even with a complete backfill, because of the bulking factor, there will be waste material on the surface that would need to be rehabilitated but only after mining is completed.

Visually both options will result in waste material being left on the surface, however, Option 3, the preferred option, entails concurrent backfill (in-pit) which allows for progressive rehabilitation before the end of mine (i.e. sloping and rehabilitation of waste rock dumps remaining on the surface). This is a major advantage over Option 1 as during the life of mine rehabilitation can already take place allowing for best practice to take place and ensure that this process is well managed and will achieve the best rehabilitation effects.

Findings

The existing visual condition of the landscape that may be affected by the proposed closure 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. Sensitivity to the project is considered *low* primarily due to the mining nature and character of the study area and that the public have not raised visual issues as a concern[2].

Offsets equivalent to the current heights and proposed final heights of the waste rock dumps (WRDs) were used to generate viewsheds that illustrate potential visibility of the WRDs at closure. The visibility of current mining activities on the Tshipi site is extensive across the study area. The closure project will cause a slight increase in visibility no matter which option ultimately prevails. However, most views to the site would be blocked or partially blocked by existing savanna vegetation and/or existing mining activities associated with the Mamatwan mine.

Visual impacts will be caused by activities associated with the preferred closure Project – Option 3. However, what is being assessed in this report, is the *difference* at closure between a *well-managed, optimally formed* and *effectively rehabilitated* closure plan verses an *unmitigated* (or at least not well rehabilitated or properly shaped to a final form) scenario.

[2] This is an assumption at this point as the public participation process has not yet been completed. It is based on the fact that the Project site is located within and area already developed for mining and that there are few highly sensitive exposed viewing areas within the study area.

To understand the impact at closure, the *intensity* of visual impact, is assessed using visibility, visual intrusion, visual exposure and viewer sensitivity criteria in a comparative analysis between the two scenarios. In terms of visibility (from where the activities will be seen), visual exposure (the relative distance between a person and an object) and sensitive viewer locations, the impact will be the same for either scenario when using these criteria. However, the effect would be different when visual intrusion criteria are considered in determining the impact of a poorly managed closure plan scenario versus a well-managed plan. Therefore, in order to rate the impact of each of these scenarios, only visual intrusion (perception) criteria are used to determine the intensity of impact and in turn the significance of visual impact.

The significance of visual impact (based on the worst-case scenario – i.e. the poorly managed closure plan) will be *moderate* as it will cause a partial loss of or alteration to key landscape elements and visual characteristics of the baseline. i.e. the impact will cause a moderate alteration (cumulative) to the visual quality of the study area due to the physical presence, scale and size of the closure Project. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected. It should have an influence on the decision. Mitigation will be required.

The significance of impact for the well managed scenario is negligible as it will cause a very minor loss or alteration to key landscape characteristics of the baseline. i.e. the impact will cause a minor alteration (cumulative) to the visual quality of the study area during rehabilitation. Targets, limits and thresholds of concern are never exceeded. No interventions or clean-up actions are required. No complaints are anticipated. It will not have an influence on the decision and does not require any further mitigation

Management measures are possible and are required to ensure, that at closure, the site has been effectively rehabilitated and can be sustained in the long term.

Cumulative effect of the Project

The impact of adjacent mining activities (Mamatwan and UMK mines), along with the general deterioration of the study area's landscape, has had a negative effect on the quality of the original landscape. The physical presence of the proposed closure Project will cause a moderate increase in impact given the poorly managed and rehabilitated scenario, However, with effective mitigation and rehabilitation (well-managed scenario), the Project's contribution to negative visual impacts would be insignificant and cumulative impacts would be contained to current levels.

Opinion of the author

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 effectively implemented, managed and monitored in the long term.

****GYLA****

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1. INTRODUCTION

1.1 Project Overview and Background

Tshipi é Ntle Manganese Mining (Pty) Ltd (Tshipi) currently operates the Tshipi Borwa open pit manganese mine located on the farms Mamatwan 331 and Moab 700, approximately 40 km north of Kathu and 18 km south of Hotazel in the Joe Morolong Local Municipality and the John Taolo Gaetsewe District Municipality in the Northern Cape Province. Tshipi currently holds the following authorisations:

- A mining right (NC/30/5/1/2/2/0206MR) issued by the Department of Mineral Resources (DMR);
- An Environmental Management Programme report (EMPr) approved by the DMR;
- An environmental authorisation (NC/30/5/1/2/2/206/000083 EM) issued by the DMR; and
- A Water Use Licence (IWUL) (10/D41K/AGJ/1735) issued by the Department of Water and Sanitation.

Key mine infrastructure includes an open pit, haul roads, run-of mine ore tip, a primary crusher, a secondary crushing and screening plant, various stockpiles for crushed and product ore, a train load-out facility, a private siding, offices, workshops, warehouses and ancillary buildings, an access control facility, various access roads, diesel generator house, electrical reticulation, clean and dirty water storage dams, water reticulation pipelines and drains, topsoil stockpiles and three waste rock dumps. The mine has an anticipated life of mine of approximately 25 years and has been operational since 2012.

The approved EMPr commits Tshipi to restore the surface to pre-mining state of wilderness and grazing and requires that the open pit is backfilled. Recent operation optimisation investigations indicate that when considering environmental, socio-economic, technical, commercial and legal factors, and, completely backfilling the open pit is sub-optimal

An alternative closure and rehabilitation strategy offer:

- The opportunities for enhanced biodiversity habitats with a different backfill approach particularly in terms of topographic variety and access to surface water;
- The opportunities for enhanced land use increase with access to surface water;
- An opportunity for earlier rehabilitation of waste rock dumps; and
- Completely backfilling the open pit is likely to sterilise an underground resource located to the north of the current approved open pit. The associated loss of employment, procurement, taxes and foreign exchange earnings is significant and will be a material net loss to the region and the country;

Tshipi is therefore proposing to change the current closure commitment to achieve a more sustainable and optimised outcome. In this regard, the proposed project focusses on:

- Concurrent backfill only i.e. in-pit dumping during mining operations only;
- Sloping and rehabilitation of waste rock dumps remaining on surface, concurrent with mining;
- Access to readily available future water supply; and
- The optimisation of the surface landforms and partially backfilled pit from a biodiversity, rehabilitation, land use and pollution prevention perspective.

Graham A Young Landscape Architect (GYLA) was commissioned by SLR Consulting (South Africa) (Pty) Ltd to carry out a visual impact assessment (VIA) of the Project. The VIA focuses on the physical aspects of the Project at closure (form, scale and bulk), within its local context.

1.2 Project site and Proposed Study area

The project site is located on the Tshipi Borwa Mine (an existing mine) property, to the immediate west of another existing mine, the Mamatwan Manganese mine. The study area comprises a visual envelope[3] of 10,0km 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 in a significant manner. Beyond this distance the scale and bulk project components will recede dramatically into the background of views[4] and have little effect on visual impact. The determination of the extent of the study area is therefore based on observations during the site visit, and taking, topography, aspect, vegetation, and structures 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 closure 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.

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 the professional opinion of the author. 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 7 and 8 May 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;
- Comment on the potential impact of the closure Project and its cumulative effects;
- 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 extent of the study area is determined by the zone of potential influence, which in this study relates to a radius of 10,0km around the Project site. At 10,0km and beyond the Project would recede into background views and or be screened by existing vegetation, mining operations or infrastructure due to distance from the viewer and the flat topography;

[3] 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 Therefore, the extent of a study area can be guided by these distance zones along with and understanding of the scale and bulk of the WRDs. In the Bureau of Land Management's 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 are 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).

[4] This is based on observations made during the site visit where existing waste rock dumps (approximately 60m in height) could barely be seen from distances greater that 10km due to the presence of savanna vegetation on a flat topography i.e. the trees tended to screen views to the site.

- The description of project components is limited to what has been supplied to the author prior to the date of completion of this report;
- No alternatives to the Project layout and site have been proposed – only the preferred option at closure has been assessed.

The visual sensitivity to the project is assumed to be low due to the context of the Project site (mining activities in the immediate area) and that during the public participation process visual issues were not raised as a concern (SLR 2019).

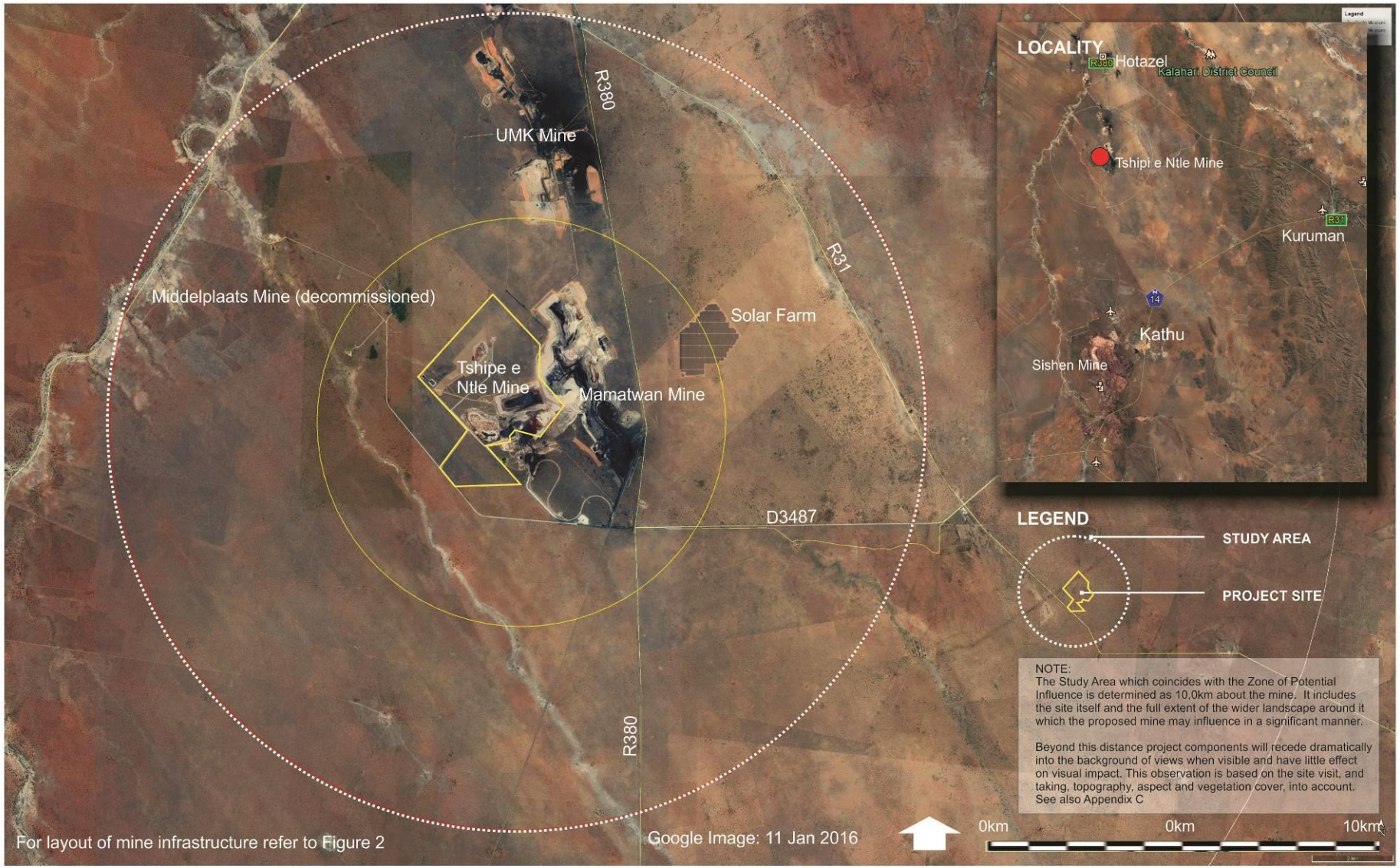

Figure 01: LOCALITY AND STUDY AREA - Tshipi Mine

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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 with 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 NEM Protected Areas Act (57 of 2003)

The main aim of the Act is to provide the framework for the declaration and management of protected areas. According to the 2014 regulations there are specific regulations for compilation of specialist report. This VIA report adheres to these specifications.

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.

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. The landscape context must be considered. The combination of the natural landscape (highveld) together with the manmade structures (residential areas, roads, and utilities) 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 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 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.

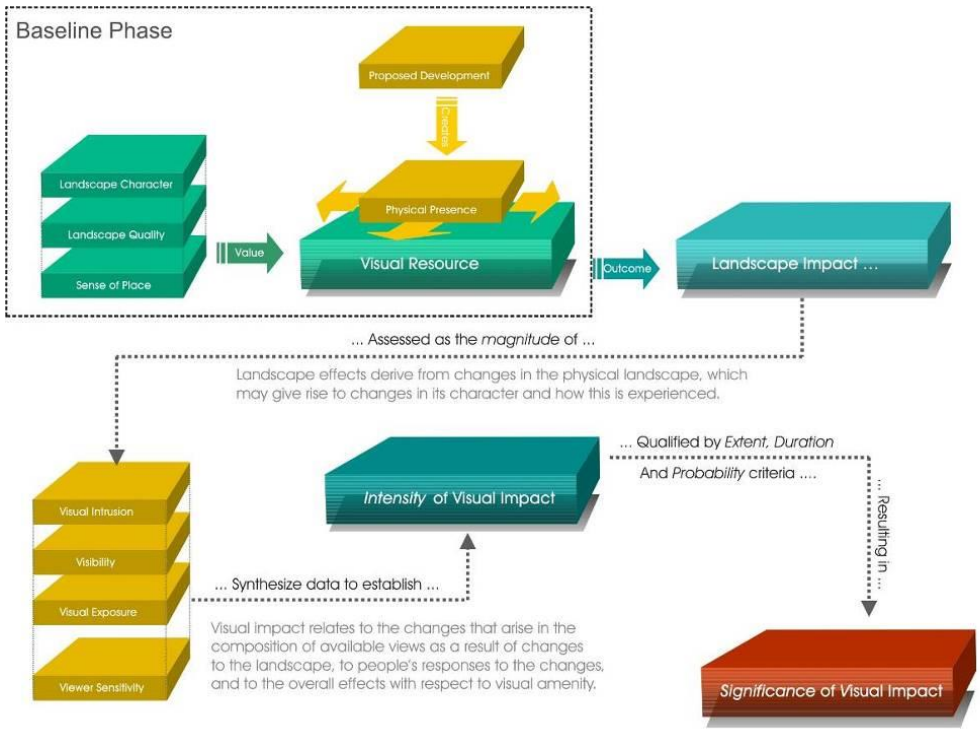

Image 1: Visual Impact Process

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 (severity) of change in the landscape brought about by the proposed new mine is based on the professional opinion of the author supported by 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 key viewpoints 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 Severity of Visual Impact

The severity 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 development. The severity 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 mine 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, as supplied by the Environmental Practitioner, was used to describe the impacts for: significance, spatial scale, temporal scale, probability and degree of certainty. A summary of each of the qualitative descriptions along with the equivalent quantitative rating scale is given 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 7 and 8th May 2019.
- Project components: The physical characteristics of the project components were described and illustrated;
- 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 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;
- 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; and
- Measures that could mitigate the negative impacts of the proposed project were recommended.

4. DESCRIPTION OF THE PROJECT

Figure 2 illustrates the layout of the closure Project's various components. Figure 2-1 is a computer model of the project overlaid onto a Google aerial photograph and provides aerial perspectives of the Project within its landscape context and illustrates the final form and bulk of the various waste rock dumps (WRD) and the in-pit dumping. Three rehabilitated WRD's will remain as residual features:

- Northern WRD (final contour level 1170m mamsl i.e. approximately 86m above ground level), which incorporates an existing WRD that was recently started;
- Western and Eastern WRD (final contour level 1170m mamsl i.e approximately 86m above ground level) that incorporate existing WRD's; And
- West WRDs (final contour level 1170 mamsl i.e. approximately 86m above ground level.

The pit will be partially filled with in-pit dumping that extends from the Western and Eastern WRD into the pit, leaving the northern section as the remaining pit void.

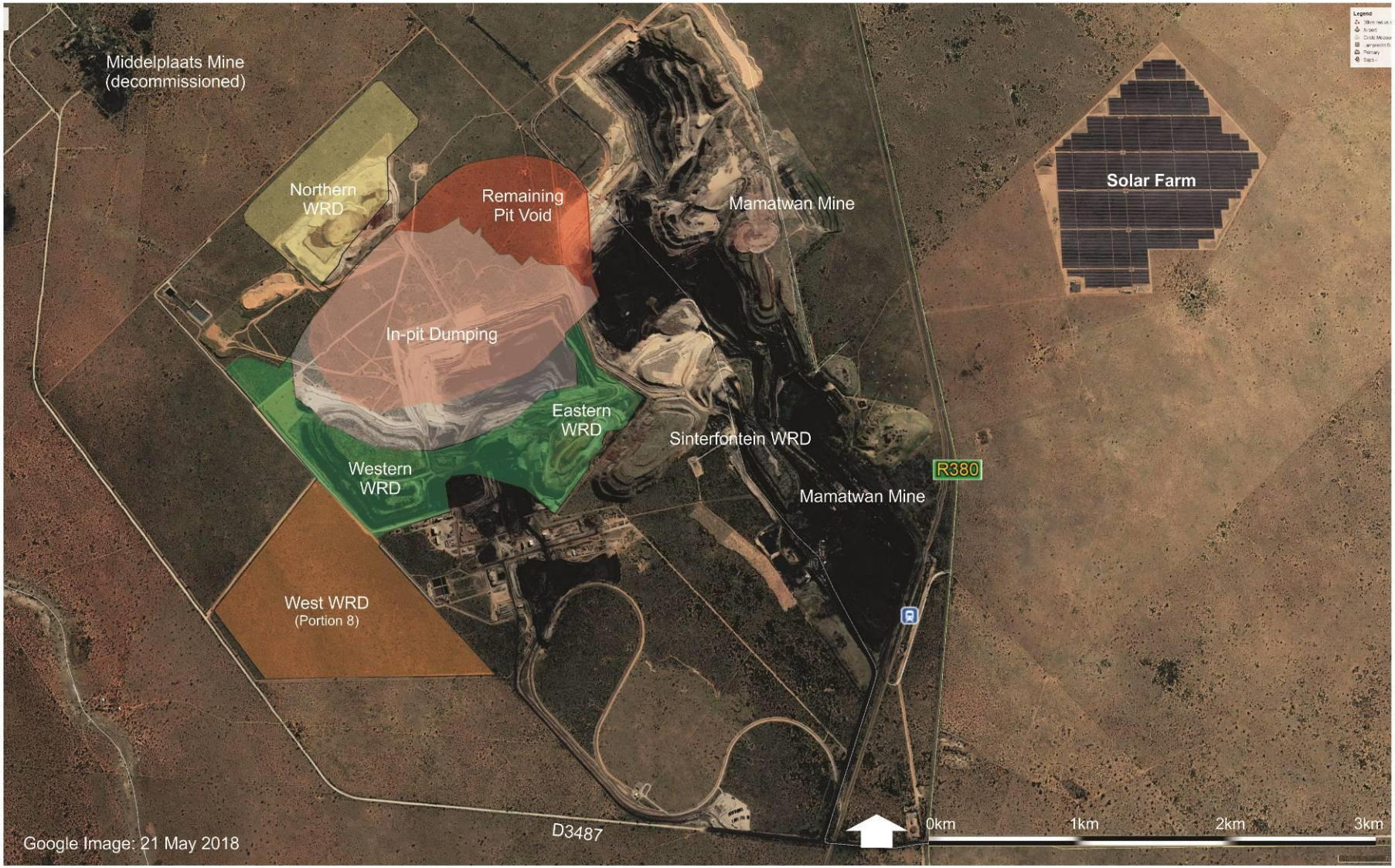

Figure 02: LAYOUT AT CLOSURE -Tshipi Mine

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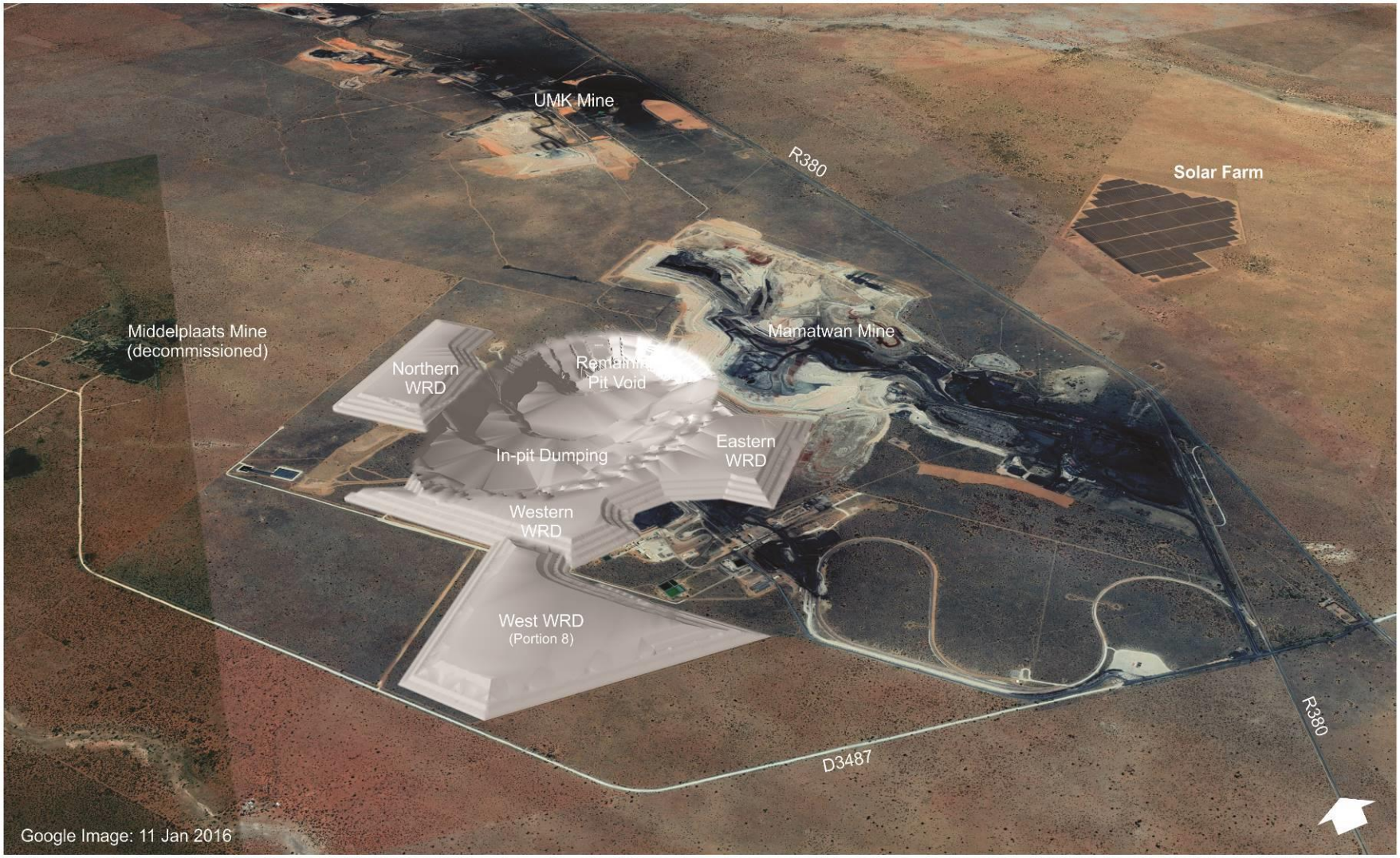

Figure 02-1: LAYOUT AT CLOSURE, AERIAL PERSPECTIVE -Tshipi Mine

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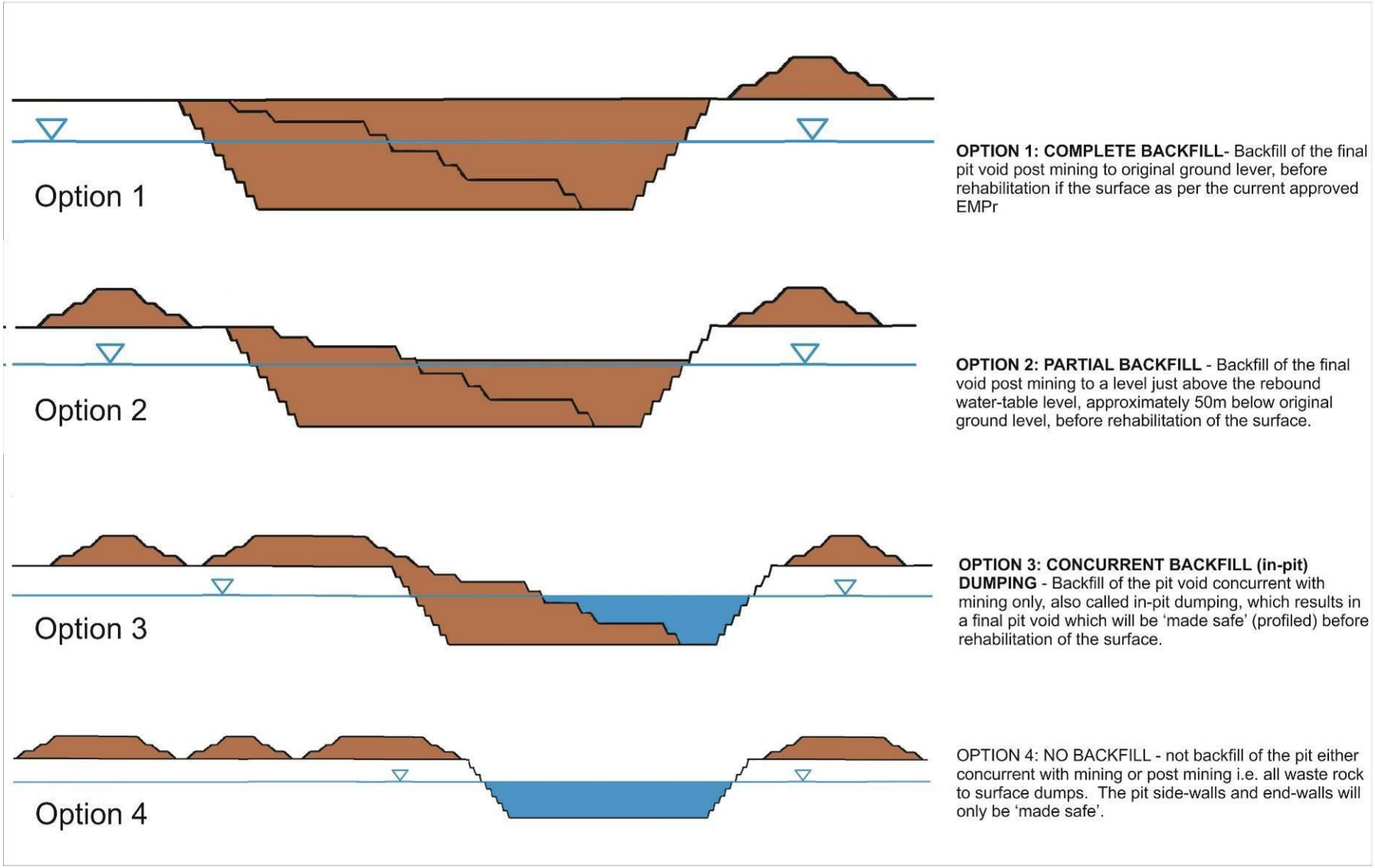

Figure 02-2: PROJECT ALTERNATIVES -Tshipi Mine

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5. PROJECT ALTERNATIVES

Four alternative closure options were considered in a preliminary options analysis (SLR 2019. These are:

- Option 1: complete backfill – Backfill of the final pit void post mining to original ground level, before rehabilitation of the surface as per the current approved EMPr
- Option 2: partial backfill – Backfill of the final pit void post mining to a level just above the rebound water-table level, approximately 50m below original ground level, before rehabilitation of the surface.
- Option 3: Concurrent backfill (in-pit) dumping - Backfill of the pit void concurrent with mining only, also called in-pit dumping, which results in a final pit void which will be 'made safe' (profiled) before rehabilitation of the surface.
- Option 4: No backfill - No backfill of the pit either concurrent with mining or post mining i.e. all waste rock to surface dumps. The pit side-walls and end-walls will only be 'made safe'

Option 3 therefore focusses on;

- Concurrent backfill only i.e. in-pit dumping during mining operations only;
- Sloping and rehabilitation of waste rock dumps remaining on surface concurrent with mining operations;
- Access to readily available future water supply; and
- Optimisation of the surface landforms and partially backfilled pit from a biodiversity, rehabilitation, land use and pollution prevention perspective.

The related preliminary conclusion was that the Option 3 comprising in-pit dumping only, is preferred in the collective context of technical, commercial, legal, socio-economic, environmental and cumulative aspects.

6. VISUAL ISSUES

Typical issues associated with mining 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?

These potential impacts will be considered and rated in later sections of the report.

7. THE ENVIRONMENTAL SETTING

7.1 General Landscape Character.

The regional landscape is characterized by open, undulating to flat sandy plains. The study area is located in the Savanna Biome of the far northern parts of the Northern Cape, within the Eastern Kalahari Savanna Bioregion and the Kathu Bushveld sub-region (Mucina and Rutherford 2006). The natural landscape comprises flat to rolling plains with medium-tall tree layer with *Acacia erioloba* in places, but mostly open and including *Boscia albitrunca* as the prominent indicator species. The shrub and grass layers are variable in cover, mostly dependant on the amount of grazing that has taken place. The main drainage line, is the Vlermuisleegte River, that crosses diagonally across the study areas from south-east to north-west, where it enters the Gamagora River.

According to Mucina and Rutherford 2006 it is 'least threatened', with 'more than 1% already transformed, including the iron ore mining locality at Shishen' (Mucina and Rutherford 2006:522). However, mining activities form a major component of the study area (Figure 5). Farming (grazing of goats and sheep) is the other main activity in the sub-region and occurs at the periphery of the study area. The rapidly growing town of Kathu lies to the south of the site.

Refer to Figure 3, which identifies the location of the panoramas in Figures 4-1 to 4-6, which illustrate the nature and landscape character of the study area. Figure 5 illustrates the various land-use types and their location.

7.1.1 Infrastructure and roads

Three large active mines exist in the study area, Tshipi Borwa, Mamatwan and UMK. They lie in a north to south band immediately west of the R380 from south (Tshipi) to north UMK and dominate the landscape character in the immediate vicinity of the Thsipi Mine (refer to Figures 4-2 to 4-6). The approximately 80m high waste rock dumps being the prominent features. A decommissioned mine (Middelplaats mine shaft and infrastructure) is located north west of Tshipi Mine.

7.1.2 Farmsteads

Three unoccupied farmsteads are located west and south of Tshipi Borwa Mine along the Vlermuisleegte drainage line (river). Immediately south of Middelplaats mine is a farm workers residence.

7.1.3 Infrastructure and roads

The main roads in the study area are the R380 that passes immediately east of the Mamatwan Mine in a south to north direction, connecting Kathu and Hotazel, and the R31 in the far eastern section of the study area. It connects Hotazel, north of the study area and Kuruman, south-east of the study area.

A railway line follows the R 380 past the Tshipi Borwa and Mamatwan and UMK mines. Another railway line, which is now abandoned (it fed the Mooiplaats Mine), passes by the western and southern sides of the project site.

Two power lines run parallel to the railway line south of the mines. The 132kv line then crosses over the R380 to meet with a small sub-station at the Solar Plant immediately east of Mamatwan Mine. It continues further north to cross back to west of the road at the UMK mine.

7.1.4 Tourism

During the site visit, there were no obvious signs of tourism activities in the study area. However, the general area is known for its game farms that cater to hunting activities and it is likely that some of the farms to the west, south and south east of the project site could include hunting activities.

7.2 Open Land

Most open land occurs in a west to east arc around the project site and comprises a flat savanna, sparsely treed landscape as described in 7.1 above.

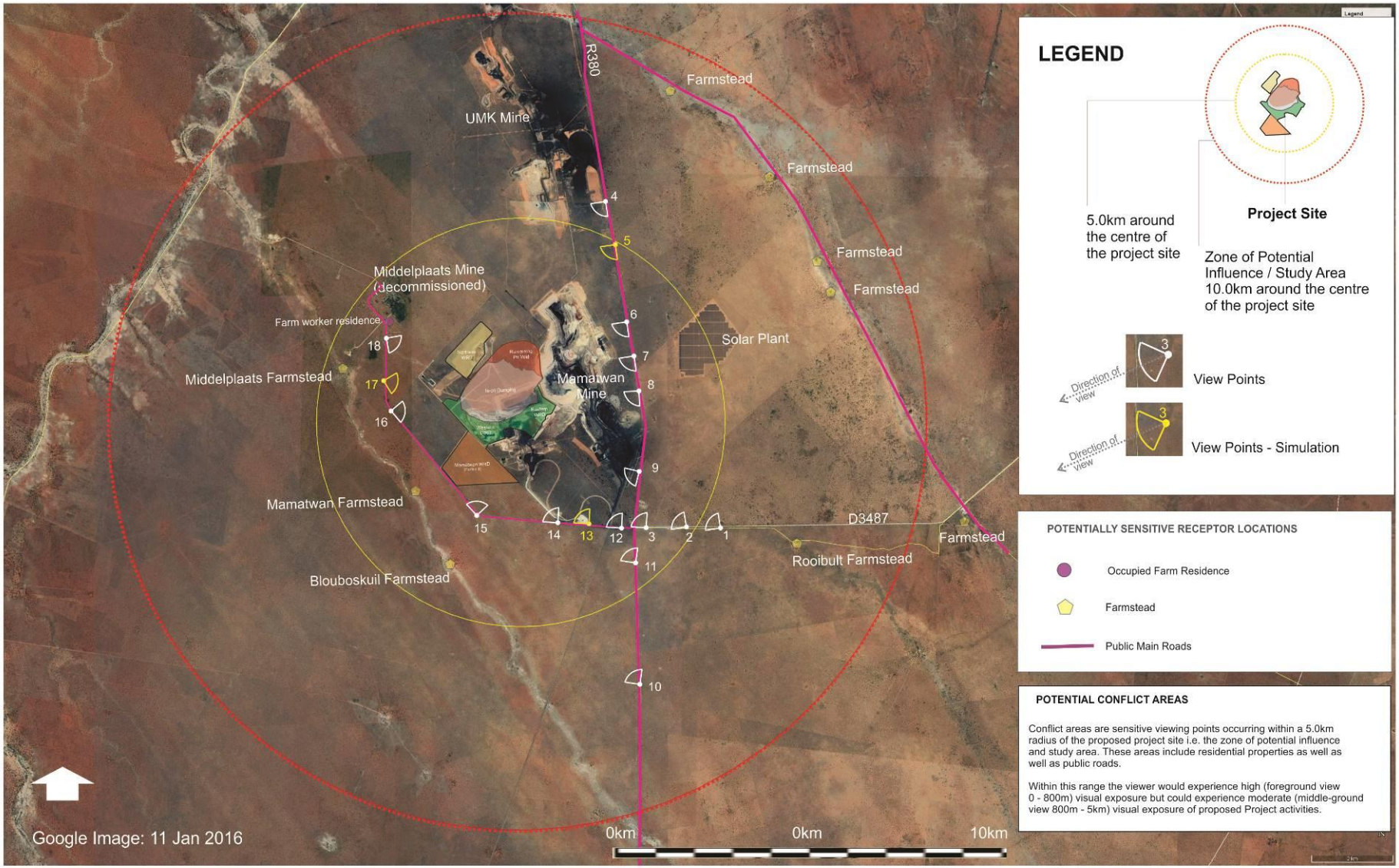

Figure 03: VIEWING POINTS AND VISUAL RECEPTORS - Tshipi Mine

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

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

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

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

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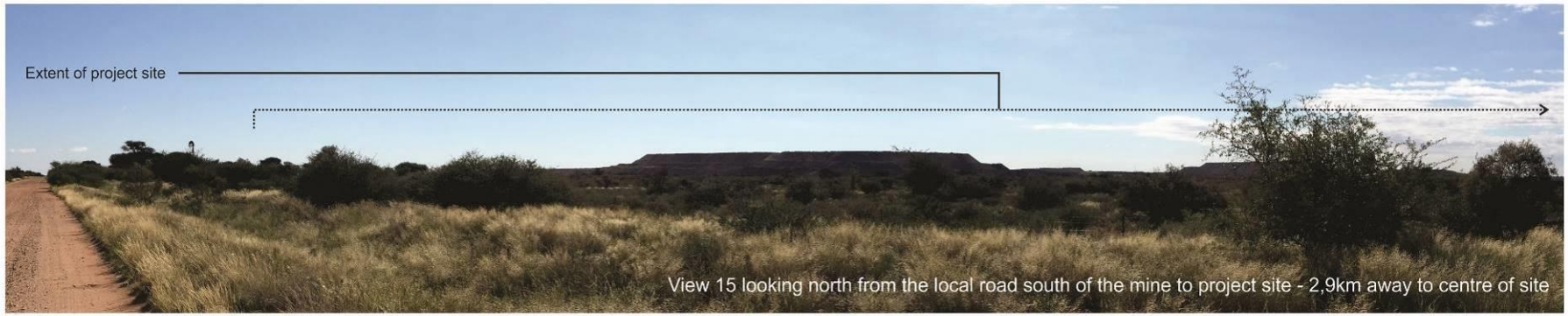

Figure 04-5 LANDSCAPE CHARACTER - Views 13, 14 and 15

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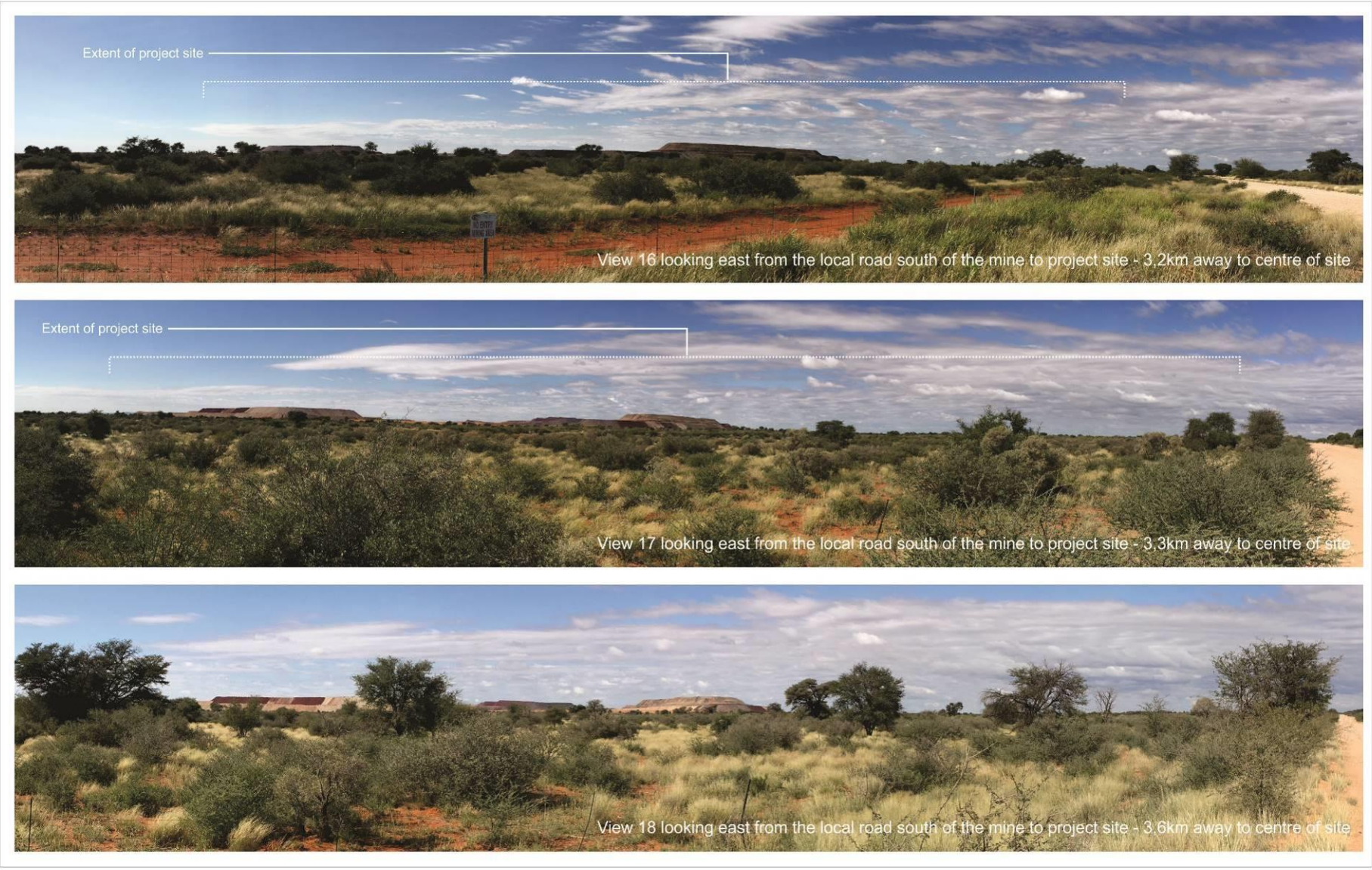

Figure 04-6 LANDSCAPE CHARACTER - Views 16, 17 and 18

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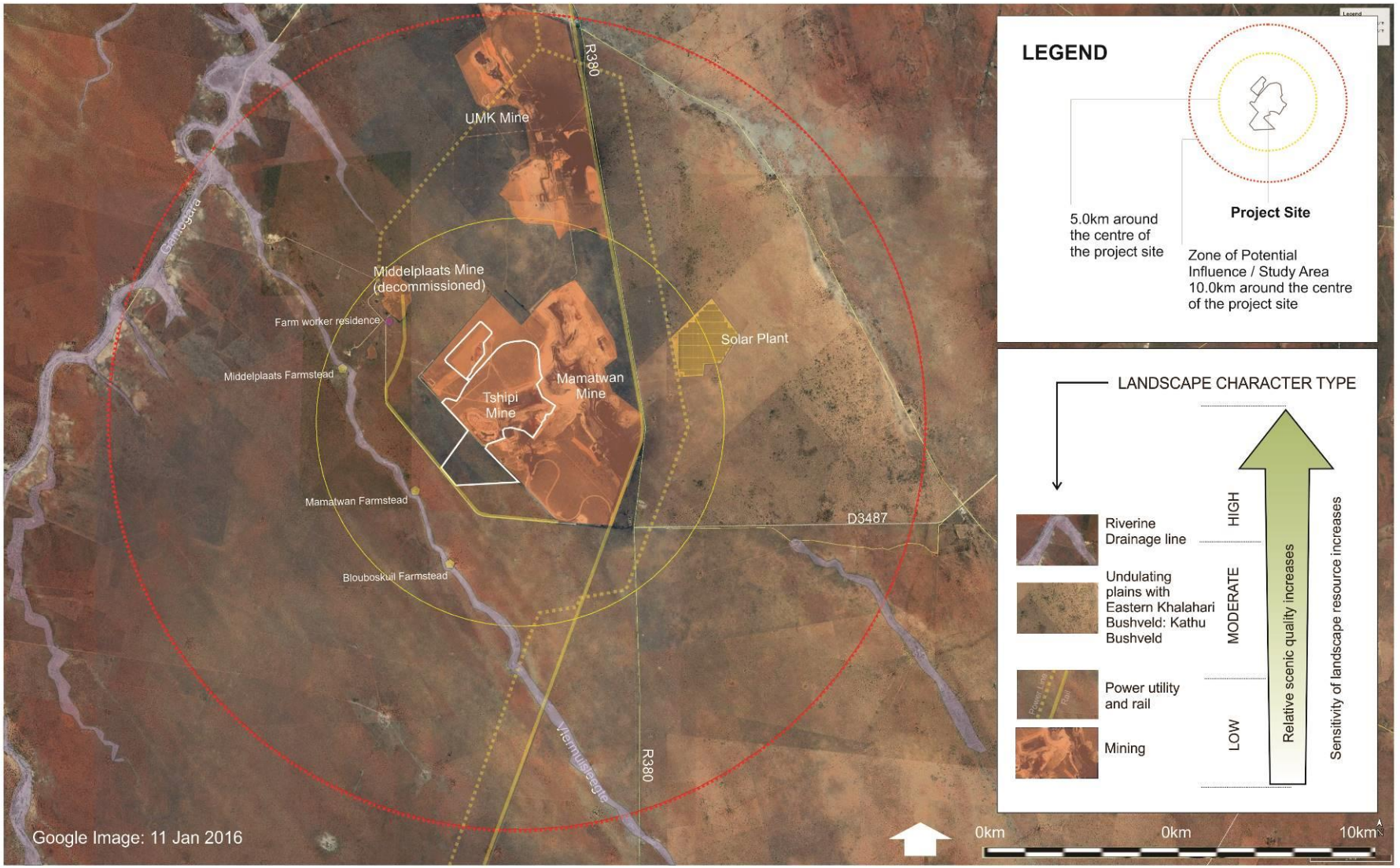

Figure 05: LANDSCAPE TYPES AND SENSITIVITIES - Tshipi Mine

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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 as landscape character types in Figure 5. Reference is also made to the panoramas in Figure 4–1 to 4-6.

When the criteria listed in Appendix A are taken together, an overall rating within the context of the sub-region, of *low* to *moderate* is allocated to the study area. The low rating is assigned because of the general sense of deterioration/degradation to the landscape, due primarily to the presence of mining, power utility and railway activities. The lowest rating is associated with the existing mines and powerline infrastructure. A moderate rating is allocated to the open savanna and moderately high rating for Vlermuisleegte and Gamagora drainage lines. A summary of the visual resource values, within the context of the sub-region, is tabulated in Table 1 below.

Table 1: Value of the Visual Resource
(After LI-IEMA 2013)

High Gamagora and Vlermuisleegte drainage lines	**Moderate** Open savanna associated with adjacent farms	**Low** Mine and utility infrastructure (i.e. the project site)
This landscape type is considered to have a *high* value because it is a: Distinct landscape that exhibits a very positive character with valued features that combine to give the experience of unity, richness and harmony. It is a landscape that may be of particular importance to conserve and which has a strong sense of place.	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.	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 sensitive to change in general and will be detrimentally affected if change is inappropriately dealt with.	Sensitivity: It is potentially sensitive to change in general and change may be detrimental if inappropriately dealt with	Sensitivity: It is not sensitive to 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. As already mentioned, the activities and land-uses in the study area are common to the northern parts of the Northern Cape, where the main economies are mining and agriculture, which along with the flat wide-open spaces give these areas their character and sense of place. However, due to the presence of major mining activities, which dominate the study area, it is showing signs of visual and aesthetic deterioration when compared with the nature landscape baseline. The landscape, specifically, within a 5km radius of the mine does not evoke a positive sense of place. Although, as one travels to the western and eastern extremities of the study area, the treed openness of the savanna becomes impressive, and varied, in the case of the Gamagora River. Refer to the views in Figure 4-1 and the aerial photograph in Figure 3.

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) of the proposed Project is considered ***low.*** The development of the WRDs and the extension of the pit will be seen within a landscape context of existing mining activities that has a high absorption capacity (i.e. the landscape's ability to absorb physical changes without transformation in its visual character and quality). The WRDs and excavation of the open pit are extensions of existing activities which have already impacted negatively on the nature and character of the original natural landscape. The only activity not occurring in an area where mining has already occurred is the West WRD. It however, is located immediately south of existing WRDs and would be seen as an extension of these.

As stated in the approach section, the physical change to the landscape at the Project site, between a well-managed closure plan and an unmanaged plan, must be understood in terms of the Project's effect on the visual aesthetics of the area (impact on the baseline aesthetic resource). The following sections discusses two scenarios that the effect the Project may have on the visual and aesthetic environment.

10. VISUAL IMPACT

Visual impacts will be caused by activities associated with the closure Project – Option 3. However, what is being assessed in this report, is the *difference* at closure between a *well-managed, optimally formed* and *effectively rehabilitated* closure plan verses an *unmitigated* (or at least not well rehabilitated or properly shaped to a final form) scenario.

At closure the final form of the waste rock dumps will be visible (whether well managed or poorly managed) as illustrated in the viewshed analyses in Figures 6 to 6-1. In pit activities will not be visible to the public.

To understand the impact at closure, the *intensity* of visual impact, is assessed using visibility, visual intrusion, visual exposure and viewer sensitivity criteria in a comparative analysis between the two scenarios. In terms of visibility (from where will the activities be seen); visual exposure (the relative distance between a person and an object) and sensitive viewer location, the impact will be the same for either scenario when using only these criteria. However, the effect would be different when visual intrusion criteria are considered in determining the impact of a poorly managed closure plan scenario verses a well-managed plan. Therefore, in order to understand the impact of each of these scenarios, only visual intrusion (perception) criteria are use. However, to contextual the activities at closure a brief discussion that includes, visibility, exposure and sensitivity of the Project follows.

10.1 Sensitive Viewers and Locations

Figure 3 identifies potential sensitive receptor locations from which closure activities would be visible. These include sections of the R380 and D3487 public roads, a farmworkers residence north west of the site and three homesteads (although these are not occupied on a permanent basis) west and south of the Tshipi mine. WRDs associated with the Mamatwan Mine, for the most part block views from the east, where no farmsteads had been identified. Sensitive receptors could be people living near the mine in the farmsteads described above or travelling along the R380 or local road D3487 (refer also to the viewshed in Figure 6). However, due to the nature of the sub-region, and the fact that a major portion of the study area is dominated by mining activities, visual sensitivity towards the mine at closure is expected to be low. Also, the public have not yet raised visual impact as a concern during the public participation process (SLR 2019). The table below sets out potential sensitivities.

Table 2: Potential Sensitivity of Visual Receptors

High	Moderate	Low
Farmworkers residence north-west of the mine	Travellers on the R380 and D3487 visiting nearby farms and farmsteads (i.e. Middleplaats, Mamatwan and Blouboskuil farmsteads and farmsteads east of the site)	Employees of the mines in the sub-region

Occupiers of residential properties with views affected by the development.	People travelling through or past the affected landscape in cars, on trains or other transport routes.	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' of each Option 3 scenario would be the same. It was set at 10,0km, as this distance, the impact of project activities would have diminished as they will recede into a busy urban background and/or views to the site would be screened by existing vegetation and structures.

In determining the visibility of the Project the proposed final heights of the WRDs was used (i.e. 80m above existing ground level). The visibility model is based on topographic relief alone (it has not factored in the tree cover) and therefore is considered the worst-case scenario. This is therefore a theoretical model, which was tested on site, where it became clear that many views to the site from within the study area were blocked by existing mining operations and vegetation.

The viewshed in Figure 6 indicates the visibility of current mining activities on the Tshipi site (i.e. the existing WRDs at their current heights), which is extensive across the study area. The analysis in Figure 6-1 has modelled the final height (80m) and extent of mining activities at closure. The viewshed will have increased slightly as indicated in Figure 6-2. This extended area of visibility is primarily to the east of the site and will affect travellers along the R380 and some properties further east of the road. However, due to the existing savanna vegetation, most views from these locations would be blocked of partially blocked. The effect of vegetation on visibility is evident in Views 1 and 2 Figure 4-1, which are located at 5,5km and 5,1km east of the Project site.

10.3 Visual Exposure

Visual exposure is determined by qualifying visibility (as indicated on Figure 6-2) with a distance rating to indicate the degree of potential intrusion and visual acuity. Exposure for both Option 3 closure scenarios would be the same.

Table 3 below indicates the exposure of the receptor sensitivity zones identified in Section 10.1. 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. Refer also to Figures 3 and 6 for location of the sensitivity zones.

Table 3: Sensitive Receptors – Visual Exposure

	Foreground view i.e. 0 – 800m from Project Site	Middle-ground view i.e. 800m to – 5,0km from Project Site	Background view i.e. > 2,0km from Project Site
Mamatwan Farmstead (unoccupied)	**X** mostly obstructed (i.e. only higher portions of the WRD would be seen)		
Unoccupied farmsteads west of the site, the Farm Workers Residence and sections of the R380 north and south of the Mamatwan Mine		**X** mostly obstructed to partially blocked by vegetation	
Farmsteads east of the mine and north of the D3487 district road			**X** and existing Mamatwan Mine activities

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 relatively high due its context amongst existing mining activities. The simulations in Figures 7-1 to 7-3 illustrate the effect that a well-managed and rehabilitated Project will have on the visual landscape when viewed from three typical exposed viewing areas north-east, south-east and west of the project site (refer to Figure 7 for these locations). The effectively rehabilitated and optimally formed WRDs will mostly be seen in the middle-ground to back-ground of views (refer to viewshed in Figure 6-2 and Figure 7-1) resulting in a *low to insignificant* visual intrusion rating (see Table 4 below). i.e. the closure project would have a minimal effect on the visual quality and sense of place of the landscape, as it would blend well with the natural veld patterns and cultural elements (existing mines) that define the structure of the landscape.

In the second, poorly managed scenario, visual intrusion would be higher. In this scenario the WRD's would not be formed optimally, rehabilitation will not have taken well, erosion of the side slopes will have taken place and the contrast of the dumps with the surrounding landscape hues would be exaggerated due to the lack of plant growth. i.e. the closure project would have a moderate negative effect on the visual quality and sense of place of the landscape as it would contrast moderately with current natural veld patterns and cultural elements that define the landscape - not unlike aspects of the current situation where WRDs have not yet been shaped or progressively rehabilitated as is illustrated in the panoramas in Figures 4-5 and 4-6.

Table 4: Visual Intrusion

High No sensitive viewing Areas	**Moderate** For the poorly managed and not well rehabilitated closure scenario	**Low** For the well managed and rehabilitated closure scenario
The Project would have a substantial negative effect on the visual quality (sense of place) of the landscape relative to the baseline landscape because it would: - Contrast with the patterns or elements that define the structure of the landscape;	• The Project would have a moderate negative effect on the visual quality (sense of place) of the landscape; • Contrast moderately with the current patterns or elements that define the structure of the landscape; • Be partially compatible with land use (industrial), settlement or enclosure patterns of the general area;	The Project would have a minimal effect on the visual quality (sense of place) of the landscape; - Contrasts minimally with the patterns or cultural elements (mines) that define the structure of the landscape; - Is mostly compatible with land use patterns;
RESULT: Notable change in landscape characteristics over an extensive area and an 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:* Minimal change resulting in a minor to insignificant change to key views from sensitive viewing areas.

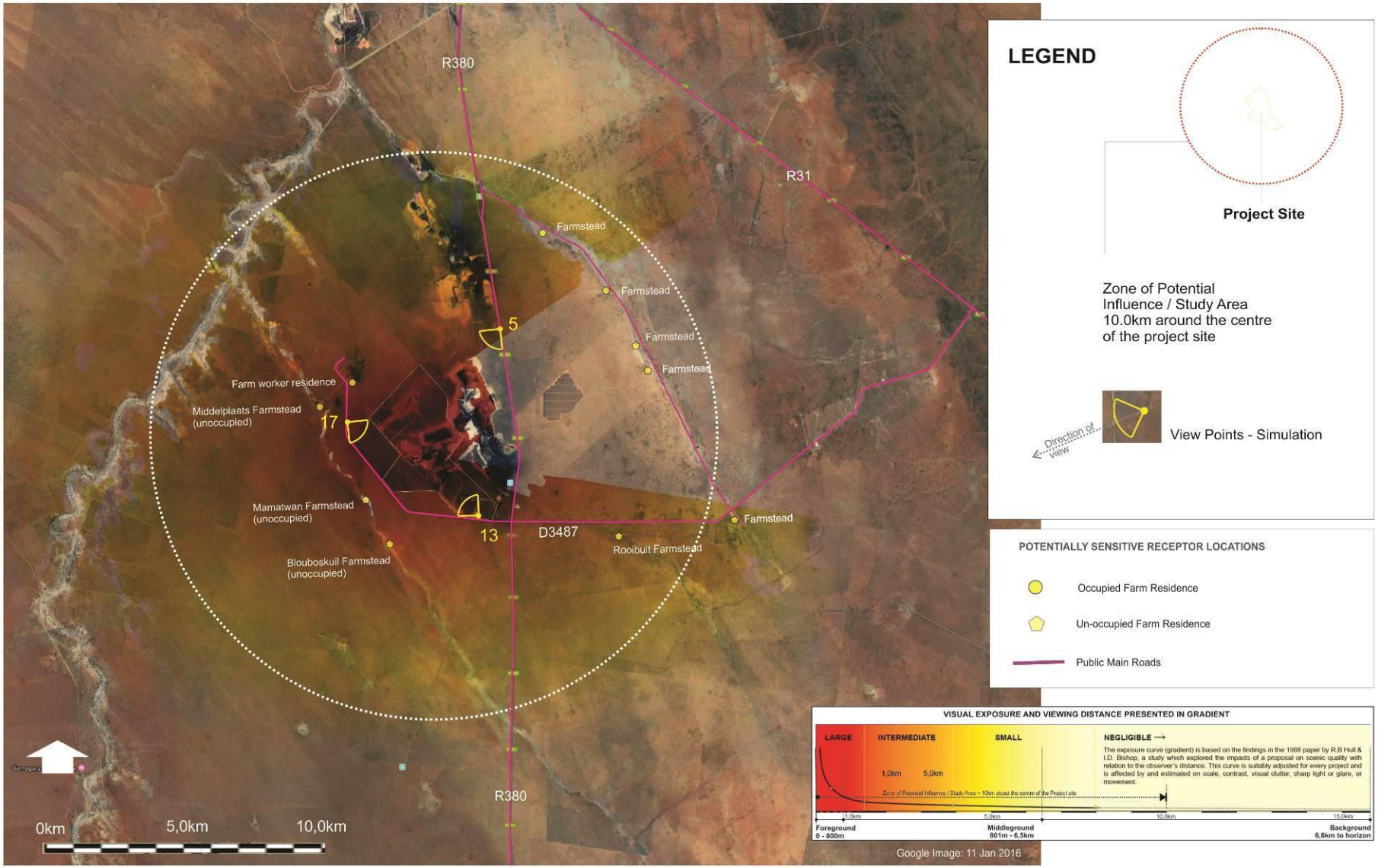

Figure 06: VIEWSHED_CURRENT MINING ACTIVITIES - Tshipi Mine

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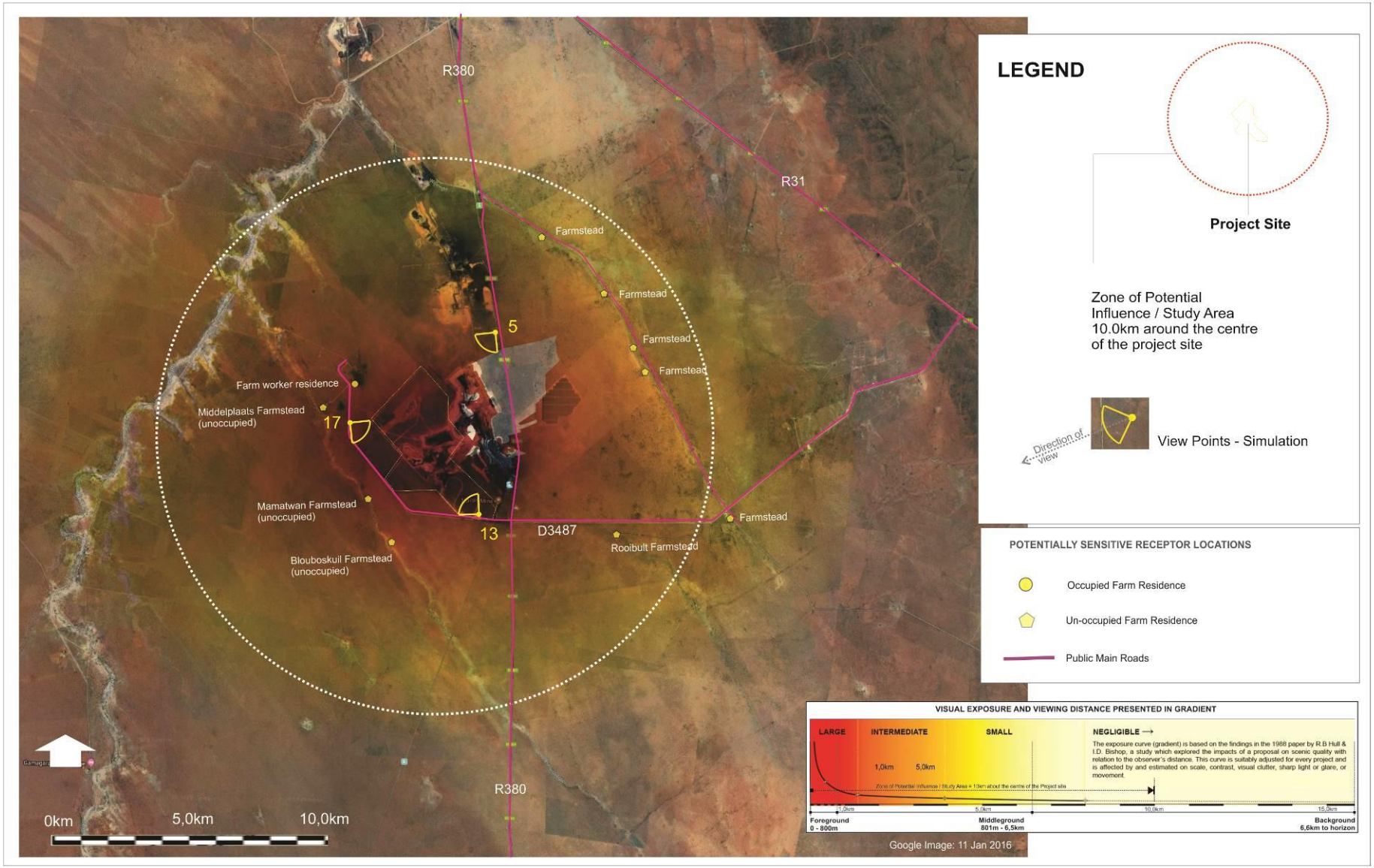

Figure 06-1: VIEWSHED_MINING ACTIVITIES AT CLOSURE - Tshipi Mine

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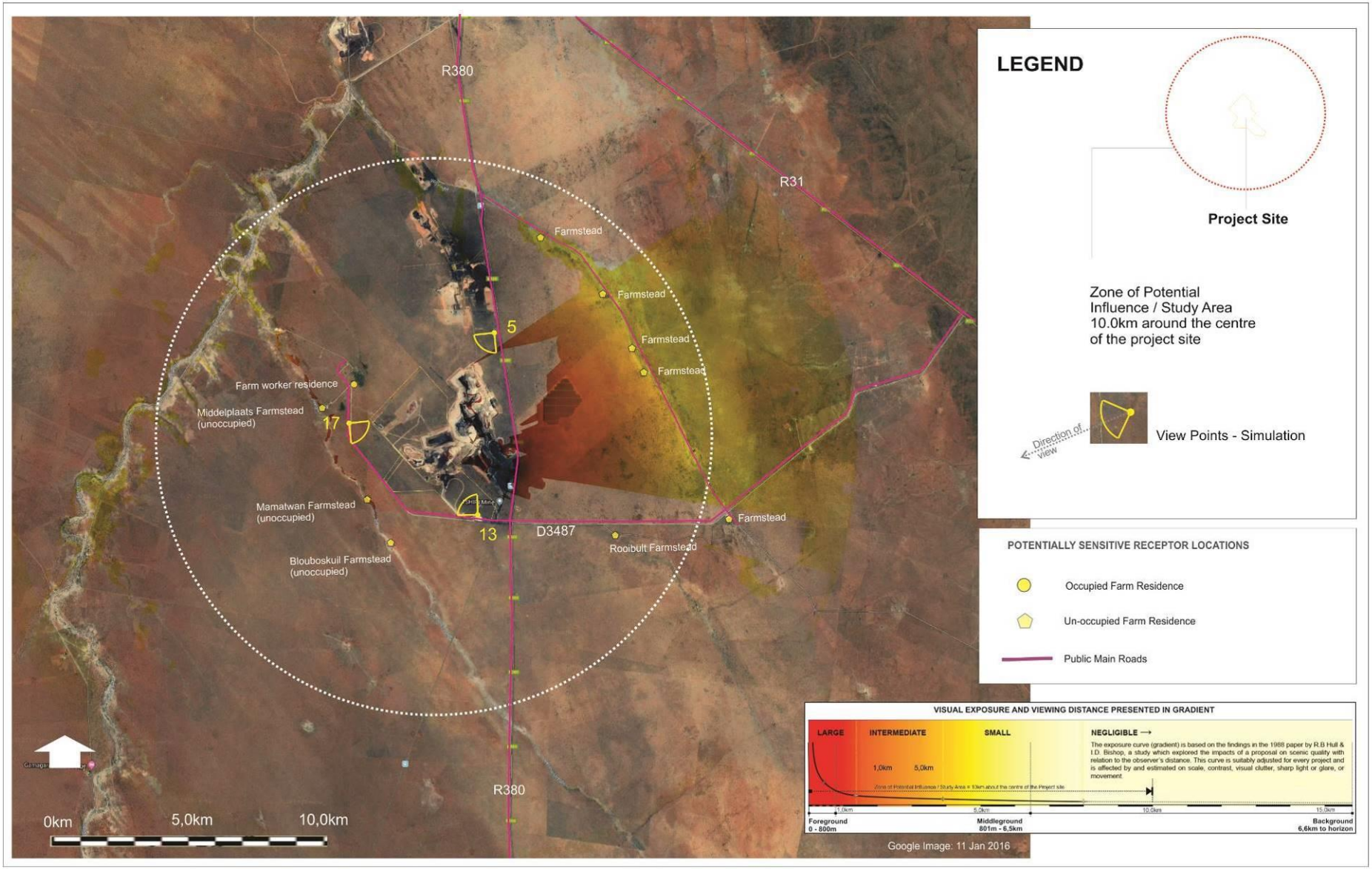

Figure 06-2: VIEWSHED_DIFFERENCE (Existing and Closure) - Tshipi Mine

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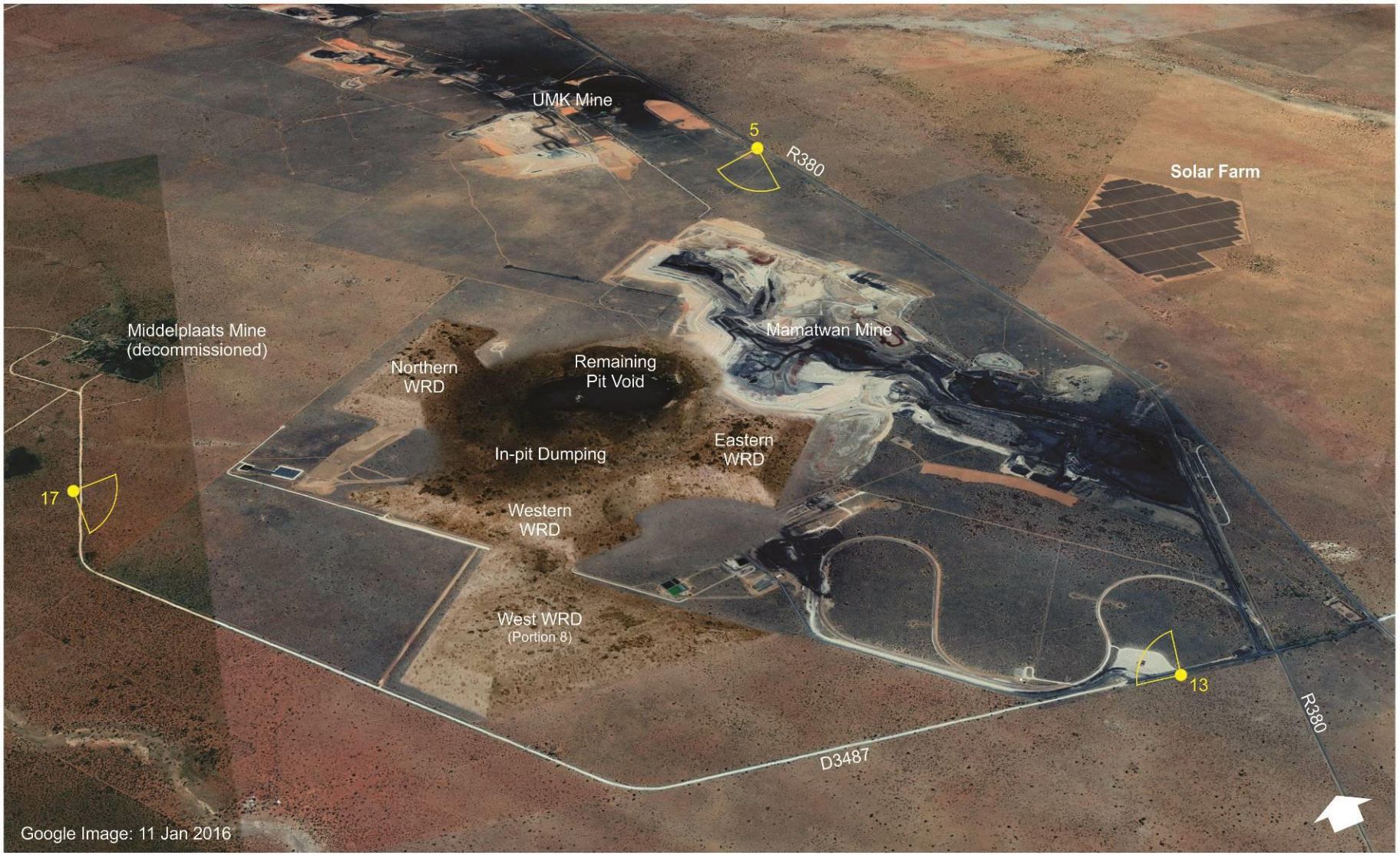

Figure 07: SIMULATION AT CLOSURE, AERIAL PERSPECTIVE -Tshipi Mine

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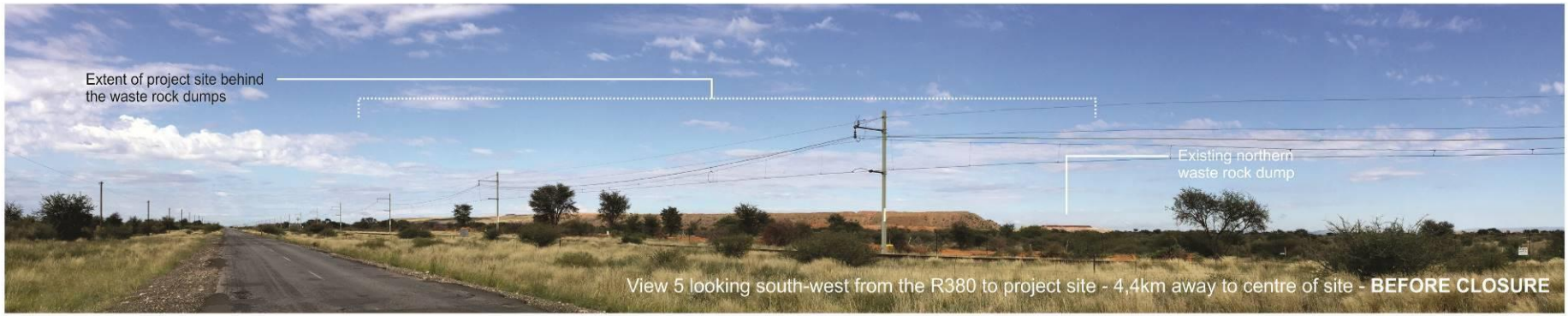

Figure 07-1: SIMULATION AT CLOSURE, VIEW 5 -Tshipi Mine

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Figure 07-2: SIMULATION AT CLOSURE, VIEW 13 -Tshipi Mine

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Figure 07-2: SIMULATION AT CLOSURE, VIEW 13 -Tshipi Mine

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10.5 Intensity of Impact

Referring to the discussions above and using visual intrusion[5] criteria only, the intensity of visual impact of the Project is rated in Table 5 below for both the Option 3 closure scenarios.

According to the results tabulated below in Table 5 the intensity of visual impact (based on the worst case scenario – i.e. the poorly managed closure plan will be *moderate* as it will cause a partial loss of or alteration to key landscape elements and visual characteristics of the baseline. The intensity of impact for the well managed scenario is negligible as it will cause a very minor loss or alteration to key landscape characteristics of the baseline.

Table 5: Intensity of Impact of the Project at closure

High	**Moderate** **For the poorly managed and rehabilitated closure scenario**	**Low**	**Negligible** **For the well managed and rehabilitated closure scenario**
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.

[5] *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.

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 Earthworks

- Earthworks to shape the WRDs should be executed in such a way that only the footprint and a small 'construction buffer zone' around the proposed WRDs 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.

11.2 WRDs and In-pit Dumping

- Final shaping and dumping should be engineered such that the sides of the dumps are articulated in a fashion that create areas of light and shadow interplay.
- Harsh, steep engineered slopes (maximum slope 1:3) should be avoided as these could impose an additional impact on the landscape by contrasting dramatically with the existing rolling topography. The waste rock dumps, are the most visible surface features that will remain at closure and it is important that a long-term view of their integration with the surrounding landscape be taken;
- The progressively reclaimed landscape can be no more stable than the adjacent undisturbed landscape; therefore, it can be assumed that the reclaimed areas will be less stable and must be designed accordingly, with gentler slopes, and drainage systems that do not concentrate run-off;
- Maintain the final landform height and slope angles for stockpiles as low as possible and not to be higher that existing rehabilitated dumps in the vicinity of the mine.
- Grass and tree seeding of the dumps should be undertaken to emulate the groupings of natural vegetation in adjacent areas and mimic where possible the within the Eastern Kalahari Savanna Bioregion (Mucina and Rutherford 2006).
- Topsoil stripped prior to development will be used to provide the growth medium.
- Dust control by vegetation cover.

11.3 Landscaping and ecological approach

- Where new vegetation is proposed to be introduced to the site and onto the WRDs, 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 Good house-keeping

- All maintenance 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.

12. SIGNIFICANCE OF IMPACT

The following tables summarises the consequence and significance of the visual impact of Option 3. These results are based on worst-case scenario when the impacts of all aspects of the Project are taken together using the impact criteria in Appendix C (SLR 2018). Consequence of impact is a function of intensity, spatial extent and duration (SLR 2018).

Table 6: Determining the CONSEQUENCE of Visual Impact at Closure

Project Activity	Poorly managed and rehabilitated closure plan				Well-managed and rehabilitated closure plan			
	I	**SS**	**D**	**C**	**I**	**SS**	**D**	**C**
Closure	M	M	H	**M**	VL	L	L	**VL**

Note:
I = Intensity
SS = Spatial Scale
D = Duration
C = Consequence

The intensity of impact, rated in Table 5, is further qualified with *consequence* (Table 6) and *probability* criteria (SLR 2018 Appendix C) to determine the *significance* (Table 7) of the visual impact.
Significance = consequence x probability.

Table 7: SIGNIFICANCE of Visual Impact

Potential Visual Impact	ENVIRONMENTAL SIGNIFICANCE							
	Poorly managed and rehabilitated closure plan				Well managed and rehabilitated closure plan			
	C	**x**	**P**	**SIG**	**C**	**x**	**P**	**SIG**
Moderate alteration (cumulative) to the visual quality of the study area due to the physical presence, scale and size of the Project. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected. It should have an influence on the decision. Mitigation will be required.	M		M	**M**				

Proposed Project – Decommissioning / Closure								
Very minor alteration (cumulative) to the visual quality of the study area during rehabilitation. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated. It will not have an influence on the decision. Does not require any further mitigation					VL		**VL**	**Insig**

Note:
C = Consequence
P = Probability
Sig = Significance

12.1 Comparison between Closure Options 1 and 3

The approved EMPr commits Tshipi Mine to restore the surface to pre-mining state of wilderness and grazing and requires that the open pit is backfilled. This is Option 1 which entails a complete backfill of the final pit void post mining before rehabilitation of the surface can take place. However, even with a complete backfill, because of the bulking factor, there will be waste material on the surface that would need to be rehabilitated but only after mining is completed.

Visually both options will result in waste material being left on the surface, however, Option 3, the preferred option, entails concurrent backfill (in-pit) which allows for progressive rehabilitation before the end of mine (i.e. sloping and rehabilitation of waste rock dumps remaining on the surface). This is a major advantage over Option 1 as during the life of mine rehabilitation can already take place allowing for best practice to take place and ensure that this process is well managed and will achieve the best rehabilitation effects.

13. CUMULATIVE EFFECT

Cumulative landscape and visual effects (impacts) result from 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 of a range of developments (i.e. other mines in the area) 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 (LI-IEMA (2013)).

13.1 Cumulative effect of the Project

The impact of adjacent mining activities (Mamatwan and UMK mines), along with the general deterioration of the study area's landscape, has had a negative effect on the quality of the original natural landscape. The physical presence of the proposed closure Project will cause a moderate negative increase in impact given the poorly managed and rehabilitated scenario. However, with effective mitigation and rehabilitation, the Project's (well-managed scenario), contribution to negative visual impacts would be insignificant and any cumulative impact would be contained to current levels.

14. CONCLUSION

The existing visual condition of the landscape that may be affected by the proposed closure 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. Sensitivity to the project is considered *low* primarily due to the mining nature and character of the study area and that the public have not raised visual issues as a concern[6].

Offsets equivalent to the current heights and proposed final heights of the waste rock dumps (WRDs) were used to generate viewsheds that illustrate potential visibility of the WRDs at closure. The visibility of current mining activities on the Tshipi site is extensive across the study area. The closure project will cause a slight increase in visibility no matter which option ultimately prevails. However, most views to the site would be blocked of partially blocked by existing savanna vegetation and/or existing mining activities associated with the Mamatwan mine.

Visual impacts will be caused by activities associated with the preferred closure Project – Option 3. However, what is being assessed in this report, is the *difference* at closure between a *well-managed, optimally formed* and *effectively rehabilitated* closure plan verses an *unmitigated* (or at least not well rehabilitated or properly shaped to a final form) scenario.

To understand the impact at closure, the *intensity* of visual impact, is assessed using visibility, visual intrusion, visual exposure and viewer sensitivity criteria in a comparative analysis between the two scenarios. In terms of visibility (from where will the activities be seen), visual exposure (the relative distance between a person and an object) and sensitive viewer locations, the impact will be the same for either scenario when using these criteria. However, the effect would be different when visual intrusion criteria are considered in determining the impact of a poorly managed closure plan scenario verses a well-managed plan. Therefore, in order to rate the impact of each of these scenarios, only visual intrusion (perception) criteria are used to determine the intensity of impact and in turn the significance of visual impact.

The significance of visual impact (based on the worst-case scenario – i.e. the poorly managed closure plan) will be *moderate* as it will cause a partial loss of or alteration to key landscape elements and visual characteristics of the baseline. i.e. the impact will cause a moderate alteration (cumulative) to the visual quality of the study area due to the physical presence, scale and size of the closure Project. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected. It should have an influence on the decision. Mitigation will be required.

The significance of impact for the well managed scenario is negligible as it will cause a very minor loss or alteration to key landscape characteristics of the baseline. i.e. the impact will cause a minor alteration (cumulative) to the visual quality of the study area during rehabilitation. Targets, limits and thresholds of

[6] This is an assumption at this point as the public participation process has not yet been completed. It is based on the fact that the Project site is located within and area already developed for mining and that there are few highly sensitive exposed viewing areas within the study area.

concern are never exceeded. No interventions or clean-up actions are required. No complaints are anticipated. It will not have an influence on the decision and does not require any further mitigation

Management measures are possible and required to ensure, that at closure, the site has been effectively rehabilitated and can be sustained in the long term.

Cumulative effect of the Project

The impact of adjacent mining activities (Mamatwan and UMK mines), along with the general deterioration of the study area's landscape, has had a negative effect on the quality of the original landscape. The physical presence of the proposed closure Project will cause a moderate increase in impact given the poorly managed and rehabilitated scenario, However, with effective mitigation and rehabilitation (well-managed scenario), the Project's contribution to negative visual impacts would be insignificant and cumulative impacts would be contained to current levels.

Opinion of the author

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 effectively implemented, managed and monitored in the long term.

****GYLA****

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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 areas *** 5+**	Distinctive, though somewhat similar to others within the region. **3**	Interesting within its setting, but fairly common within the region. **1**
Cultural modifications	Modifications add favourably to visual	Modifications add little or no visual variety to the	Modifications add variety but are very discordant

	variety while promoting visual harmony. **2**	area, and introduce no discordant elements. **0**	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.

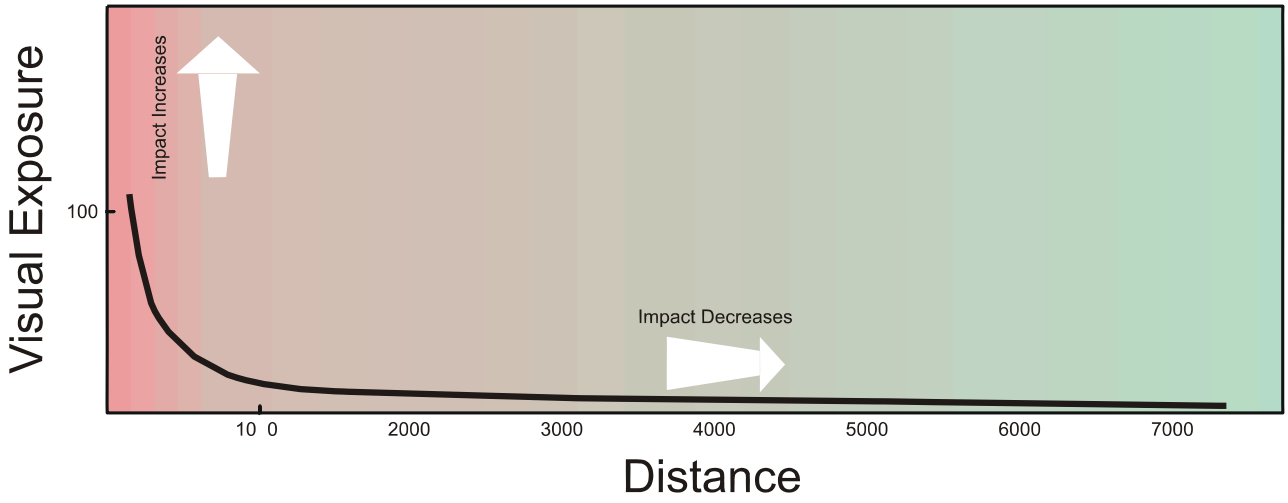
Depending on topography and vegetation, middle ground is sometimes considered to be up to 8.0km.

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 industrial areas
Occupiers of residential properties		

with views affected by the development.

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

PART A: DEFINITIONS AND CRITERIA*		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of intensity, spatial extent and duration**
Criteria for ranking of the INTENSITY of environmental impacts	**VH**	Severe change, disturbance or degradation. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits and thresholds of concern regularly exceeded. Will require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance or discomfort. Associated with real but not substantial consequences. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance or nuisance. Associated with minor consequences or deterioration. Targets, limits and thresholds of concern rarely exceeded. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance or nuisance. Associated with very minor consequences or deterioration. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.
	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	**VL**	Very short, always less than a year. Quickly reversible
	L	Short-term, occurs for more than 1 but less than 5 years. Reversible over time.
	M	Medium-term, 5 to 10 years.
	H	Long term, between 10 and 20 years. (Likely to cease at the end of the operational life of the activity)
	VH	Very long, permanent, +20 years (Irreversible. Beyond closure)
Criteria for ranking the EXTENT of impacts	**VL**	A part of the site/property.
	L	Whole site.
	M	Beyond the site boundary, affecting immediate neighbours
	H	Local area, extending far beyond site boundary.
	VH	Regional/National

PART B: DETERMINING CONSEQUENCE

			EXTENT				
			A part of the site/property	Whole site	Beyond the site, affecting neighbours	Local area, extending far beyond site.	Regional/ National
			VL	L	M	H	VH
INTENSITY = VL							
DURATION	Very long	VH	Low	Low	Medium	Medium	High
	Long term	H	Low	Low	Low	Medium	Medium
	Medium term	M	Very Low	Low	Low	Low	Medium
	Short term	L	Very low	Very Low	Low	Low	Low
	Very short	VL	Very low	Very Low	Very Low	Low	Low
INTENSITY = L							
DURATION	Very long	VH	Medium	Medium	Medium	High	High
	Long term	H	Low	Medium	Medium	Medium	High
	Medium term	M	Low	Low	Medium	Medium	Medium
	Short term	L	Low	Low	Low	Medium	Medium
	Very short	VL	Very low	Low	Low	Low	Medium
INTENSITY = M							
DURATION	Very long	VH	Medium	High	High	High	Very High
	Long term	H	Medium	Medium	Medium	High	High
	Medium term	M	Medium	Medium	Medium	High	High
	Short term	L	Low	Medium	Medium	Medium	High
	Very short	VL	Low	Low	Low	Medium	Medium
INTENSITY = H							
DURATION	Very long	VH	High	High	High	Very High	Very High
	Long term	H	Medium	High	High	High	Very High
	Medium term	M	Medium	Medium	High	High	High
	Short term	L	Medium	Medium	Medium	High	High
	Very short	VL	Low	Medium	Medium	Medium	High
INTENSITY = VH							
DURATION	Very long	VH	High	High	Very High	Very High	Very High
	Long term	H	High	High	High	Very High	Very High
	Medium term	M	Medium	High	High	High	Very High
	Short term	L	Medium	Medium	High	High	High
	Very short	VL	Low	Medium	Medium	High	High
			VL	L	M	H	VH
			A part of the site/property	Whole site	Beyond the site, affecting neighbours	Local area, extending far beyond site.	Regional/ National
			EXTENT				

PART C: DETERMINING SIGNIFICANCE							
PROBABILITY (of exposure to impacts)	Definite/ Continuous	**VH**	**Very Low**	**Low**	**Medium**	**High**	**Very High**
	Probable	**H**	**Very Low**	**Low**	**Medium**	**High**	**Very High**
	Possible/ frequent	**M**	**Very Low**	**Very Low**	**Low**	**Medium**	**High**
	Conceivable	**L**	**Insignificant**	**Very Low**	**Low**	**Medium**	**High**
	Unlikely/ improbable	**VL**	**Insignificant**	**Insignificant**	**Very Low**	**Low**	**Medium**
			VL	**L**	**M**	**H**	**VH**
			CONSEQUENCE				

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
Very High	Potential fatal flaw unless mitigated to lower significance.
High	It must have an influence on the decision. Substantial mitigation will be required.
Medium	It should have an influence on the decision. Mitigation will be required.
Low	Unlikely that it will have a real influence on the decision. Limited mitigation is likely to be required.
Very Low	It will not have an influence on the decision. Does not require any mitigation
Insignificant	Inconsequential, not requiring any consideration.

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.

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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 30 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.

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.*

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