FINAL

Visual Impact Assessment Report

PROPOSED GLENCORE EASTERN MINES EXPANSION PROJECT LIMPOPO PROVINCE

Graham A. Young PrLArch

Newtown Landscape Architects

PROPOSED GLENCORE EASTERN MINES EXPANSION PROJECT

LIMPOPO PROVINCE

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NLA Project No:	2248/V16L
Report Revision No:	FINAL
Date Issued:	04 April 2018
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Reference:	Glencore Eastern Mines – Expansion Project

EXPERTISE OF SPECIALISTS

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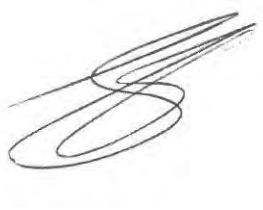
DECLARATION OF INDEPENDENCE

I, Graham Young, declare that –

- I am contracted as the Visual Impact Assessment Specialist for the Glencore Eastern Mines Extension 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).



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04 April 2018

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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 ii, Appendix E
The expertise of that person to compile a specialist report including a curriculum vitae	Page ii, Appendix E
A declaration that the person is independent in a form as may be specified by the competent authority	Page iii
An indication of the scope of, and the purpose for which, the report was prepared;	Section 1.3 – 1.4
(cA) an indication of the quality and age of base data used for the specialist report;	Section 3.2
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 14 and 15
The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.2
A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3 and Appendix E
details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 5 & 6
An identification of any areas to be avoided, including buffers	
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figures 5 and 6
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.5
A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 12.2
Any mitigation measures for inclusion in the EMPr;	Section 13
Any conditions for inclusion in the environmental authorisation	Section 13

Any monitoring requirements for inclusion in the EMPr or environmental authorisation	N/A
A reasoned opinion whether the proposed activity, activities or portions thereof should be authorised regarding the acceptability of the proposed activity or activities; and	Section 14 and 15
If the opinion is that the proposed activity, or activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 13
A description of any consultation process that was undertaken during the course of carrying out the study	Section 6
A summary and copies if any comments that were received during any consultation process	Section 6
Any other information requested by the competent authority.	N/A

ACRONYMS, ABBREVIATIONS & GLOSSARY

Acronyms & Abbreviations	
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
IFC	International Finance Corporation
NLA	Newtown Landscape Architects
WRD	Waste Rock Dump
PCD	Pollution Control Dam
RWD	Return Water Dam
TSF	Tailings Storage Facility
VIA	Visual Impact Assessment

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 report the Project Study area refers to the proposed project footprint / project site as well as the 'zone of potential influence' (the area defined as the radius beyond which the visual impact of the most visible features will be insignificant due primarily to the nature of the terrain and that the project activities occur in a valley system), which is a 3.0km radius about the centre point of the various project components.
Project Footprint / Site	For the purposes of this report the Eskom Kudu SS Oranjemond Project *site* / *footprint* refers to the actual layout of the project.
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 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

It is clear when one visits the project sites that prior to the impact of mining activities, the study area would have had a spectacular landscape, given the impressive mountains and rivers associated with the Dwars River system. However, when the landscape types are taken in their totality, and due to the impact of mining activities, the combination of assigned scenic quality ratings suggests an overall rating of moderate for the study area. This is to be understood within the context of the region. Because of this rating, the study area and particularly the landscape surrounding the Project sites, is rated moderately sensitive to change that might occur due to Project activities.

It is anticipated that relatively minor visual resource impacts would result from the operation of the proposed Project. Specifically, impacts would result from the Thorncliffe TSF (in its latter stages) being seen from sensitive viewing areas (Didingwe Lodge game viewing areas) and the Helena WRD being seen (although views are mostly blocked by existing trees) from the Leshaba Community dwellings, as well as their cumulative effect on the scenic values of the landscape.

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, tourist areas or from public travel routes, especially when the activity would appear in foreground views. Visual impacts that would result during the Operational Phase of the Project, specifically caused by the Thorncliffe TSF and Helena WRD, will be minor and short term and will not occur in foreground views. The Thorncliffe TSF impact will occur when the upper levels of the facility (i.e. late into the project) would become visible to game viewing areas on the Didingwe Lodge property.

At Closure and Decommissioning when the final grading is carried out on the WRD and TSF and topsoil is deposited on the side slopes and then hydroseeded, the impact without mitigation is rated *low* since the TSF would remain visible to some middle-ground views and dust could be generated during the initiation of the rehabilitation period. With effective dust suppression techniques and the successful spreading of topsoil and hydroseeding, the impact would reduce to *very low*.

At Post Closure, the impact will be *very low* and with effective long-term management measures would remain at this rating.

It is of the opinion of the author that the proposed activities should be authorised as they fall within an acceptable level of change, with the proviso that the management measures be agreed to and that they be rigorously applied and effectively managed.

*** NLA ***

Nr	Activity	Impact	With or Without Mitigation	Nature (Negative or Positive impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance		Mitigation Measures	Mitigation Effect
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude		
Planning Phase																
1	No planning activities relevant to visual impacts															
Construction Phase:																
5	Preparation of earthworks and the construction of the **Magareng and Thorncliffe Vent Shafts**	Build access roads to sites; excavate of earth to create terrace for shaft and prepare sites for WRD and TSF; construction activities to build the shaft complex	WOM	Negative	Probable	2	Short term	1	site	2	Low	2	10	Negative	Remove only vegetation that occurs within the project footprints. Ensure dust suppression techniques are used. Establish a vegetation buffer around the perifery of the vent shaft site. Arid along the south and east sides of the WRD site	Can be avoided, managed or mitigated
			WIM	Negative	Probable	2	Short term	1	site	2	Low	2	10	Negative		
Operational Phase:																
8	Ongoing construction of the **Thorncliffe TSF and WRD**	Exposure of earth and rock (contrast with existing landscape character) and the physical presence of the rising sides to the TDF resulting in a cummulative impact that alters the visual environment and sense of place of the study area. These activities which would also generate dust. This activity is screened from nearby tourist activities and roads that would be used by the general public. Also mostly screened from sensitive viewing areas by existing adjacent mining and plant activities until the TSF reaches its highest elevations	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	Dust suppression techniques must be implemented across the site. Progressive mitigation along the side slopes of the TDF with indigenous grass species	Can be avoided, managed or mitigated
			WIM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	28	Low		Can be reversed
10	Ongoing construction of the **Helena WRD and PCD**	Physical presence: Exposure of earth and rock (contrast with existing landscape character) and the growth of the WRD resulting in a cummulative impact that alters the visual quality and sense of place of the study area. These activities which would also generate dust. This activity is screened from nearby tourist activities and roads that would be used by the general public	WOM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible	Mitigation will be difficult. Remove vegetation in sections or as exception planning. Ensure that vegetative bands planted during the construction phase are maintained along the eastern and southern sides of the site. Implement dust suppression techniques. Continue with infill planting along the eastern and southern sides of the site using indigenous trees and shrubs	May cause irreplaceable loss of resources
			WIM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible		Can be avoided, managed or mitigated
11	Trucks moving mined activities to **TSF** and **WRD** elsewhere on the project site and private mine mainly the access roads - also other workers visiting the roads	Physical presence: Dust generated by moving trucks that is visible from surrounding areas resulting in a localised near other mining infrastructure and will not be visible from nearby tourist areas. These activities could be visible from nearby tourist areas.	WOM	Negative	Probable	2	Short term	1	site	2	low	2	10	Negligible	The effective application of dust suppression techniques will reduce the impact	Can be avoided, managed or mitigated
			WIM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible		Can be reversed
12	Operation of the **Magareng Vent Shaft**	Physical presence: Presence of the shaft and its ancillary activities at its base. However, the shaft in located near other mining infrastructure and will not be visible from sensitive tourist locations	WOM	Negative	Probable	2	Short term	1	Site	3	Low	2	10	Negligible	Good housekeeping around the shaft and all structures to be painted a colour that blends with the surrounding environment.	Can be avoided, managed or mitigated
			WIM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible		Can be reversed
13	Lighting of the three sites including security and any construction activities within the movement of vehicles at night	Light pollution resulting in the alteration (accumulative impact) of the baseline visual environment and sense of place of the project site. These activities (TDF only) could be visible from nearby tourist activities. It should be noted however that the study area provides a background of which night lighting is prevalent.	WOM	Negative	Highly Probable	4	Short term	1	Regional	3	Low	2	24	Low	Install light fixtures that provide precisely directed illumination to reduce light spillage beyond the immediate surrounds of the sites. Avoid high pole top security lighting. Where security lighting is required at the periphery of the site it should be activated by movement and are not permanently switched on	Can be avoided, managed or mitigated
			WIM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible		Can be reversed
Closure and Decommissioning Phase																
14	Final shaping and rehabilitation of **WRD** and **TDF**	Improvement of the visual quality and sense of place of the Operational Phase of the project.	WOM	Negative	probable	2	Long term	4	Regional	3	Low	2	18	Negligible	Apply effective dust suppression techniques. Rehabilitation (hydroseeded) of the WRD and shaped to avoid sharp engineered lines. Band of trees along the east and south sides of the WRD site to be maintained and managed.	Can be avoided, managed or mitigated
				Negative												
			WIM		Probable	2	Long term	4	Regional	3	Low	2	18	Negligible		Can be reversed
15	Closure of the **Magareng and Thorncliffe Vent Shafts**	Physical presence of the activities associated with removing the structures and rehabilitating the site. However, these activities will most likely not be visible from sensitive viewing areas. Visual environment will improve from the operational phase	WOM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	Ensure dust supression techniques are effectively applied and that the site is rehabilitated with indigenous grasses, shrubs and trees	Can be reversed
			WIM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible		Can be reversed
Post-Closure Phase																
16	Rehabilitation of exposed areas and growth of grasses and vegetation for all three sites	Improvement of the visual quality and sense of place from the operational and decommissioning phases relating to the cumulative effect of mining activities in the area against the baseline.	WOM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	Effective management of rehabilitated areas, the side slopes of the TDF and the tree bands	Can be reversed
			WIM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible		Can be reversed

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1. INTRODUCTION

1.1 Project Overview and Background

Newtown Landscape Architects (NLA) was commissioned by Exigo Sustainability (Pty) Ltd to carry out a Visual Impact Assessment (VIA) for the proposed Glencore Eastern Mines – Expansion Project, located near Steelpoort, Limpopo Province ("the Project"). This report will form part of the EIA report for the project.

1.2 Study area

The study area comprises the sum of a 3.0km radius around each of the project sites. This spatial dimension is contained within the Dwars River valley systems as indicated in Figures 1 and 2.

1.3 Objective of the Specialist Study

The main aim of the VIA is to ensure that the visual / aesthetic consequences of the proposed project are understood and adequately considered in the environmental planning process. In the final assessment phase, the impact of the Project will be rated and mitigation measures that could reduce the impact of the Project will be proposed.

1.4 Terms and Reference

A specialist study is required to establish the visual baseline and to identify the visual impacts issues arising from the Project based on the general requirements for a comprehensive VIA. The following terms of reference was established:

- Conduct a field survey (14 and 15 November 2016) of the proposed study area and photograph the area from sensitive viewing points;
- Establish the baseline i.e. landscape and visual sensitivities;
- Determine visual / aesthetic issues that must be assessed in the Assessment Phase;
- Assess the impact of the proposed Project and its cumulative effects (Assessment Phase);
- Rate the project specific and cumulative impacts (Assessment Phase); and
- Have input, together with Exigo, other specialists and the technical project team, into project management measures (Assessment Phase).

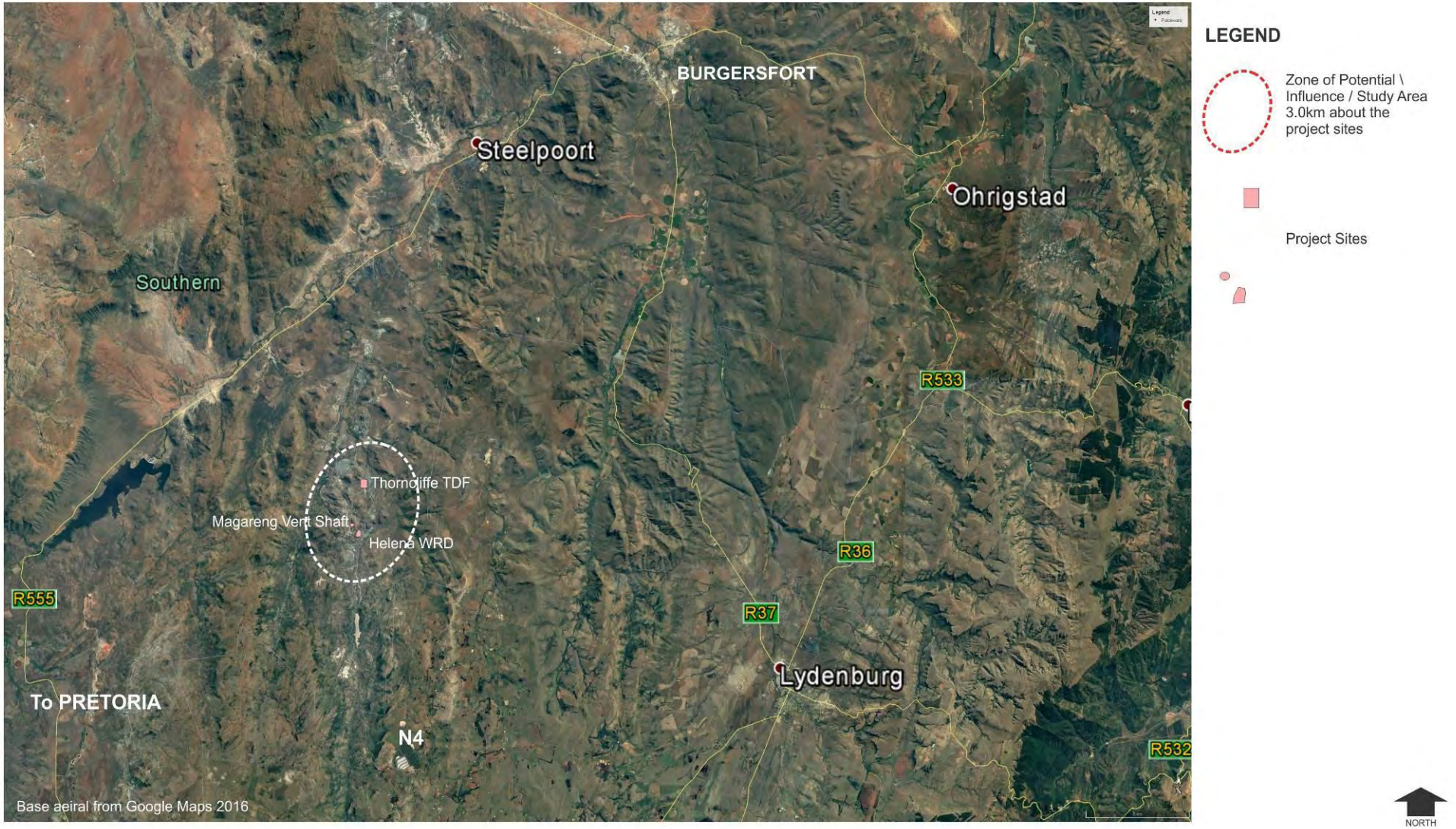


Figure 1: LOCALITY AND STUDY AREA - REGIONAL CONTEXT

1.5 Assumption, Uncertainties and Limitations

The following assumptions and limitations have been made in the study:

- The extent of the study area is determined by the zone of potential influence. At 3,0 km and beyond Project components would recede into background of views or be screened by topographic relief and vegetation.

2. LEGAL REQUIREMENTS AND GUIDELINES

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

2.1 National Guidelines

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

The specialist report is in accordance to the specification on conducting specialist studies as per Environmental Impact Assessment Regulations, 2014 (as amended in 2017) 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 Plan (EMP) and will be in support of the Environmental Impact Assessment (EIA).

The NEMA Protected Areas Act (57 of 2003)

The main aim of the Act is to identify and protect natural landscapes. According to the 2010 regulations of the said Act, there are specific regulations for compilation of specialist report(s). 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 it provides guidance that will be appropriate for any EIA process. The Guideline document also seeks to clarify instances when a visual specialist should get involved in the EIA process.

2.2 International Guidelines

NLA work towards the standards as contained in the World Bank's IFC Performance Standards as highlighted below.

World Bank's IFC Standards

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

"Mining operations, and in particular surface mining activities, may result in negative visual impacts to resources associated with other landscape uses such as recreation or tourism. Potential contributors to visual impacts include high walls, erosion, discoloured water, haul roads, waste dumps, slurry ponds, abandoned mining equipment and structures, garbage and refuse dumps, open pits, and deforestation. Mining operations should prevent and minimize negative visual impacts through consultation with local

communities about potential post-closure land use, incorporating visual impact assessment into the mine reclamation process. Reclaimed lands should, to the extent feasible, conform to the visual aspects of the surrounding landscape. The reclamation design and procedures should take into consideration the proximity to public viewpoints and the visual impact within the context of the viewing distance. Mitigation measures may include strategic placement of screening materials including trees and use of appropriate plant species in the reclamation phase as well as modification in the placement of ancillary facilities and access roads."

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

3. APPROACH AND METHODOLOGY

3.1 Approach

The assessment of likely effects on a landscape resource and on visual amenity is complex, since it is determined through a combination of quantitative and qualitative evaluations. (The Landscape Institute with the Institute of Environmental Management and Assessment, 2002). 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 or activity into a view or scene).

3.1.1 The Visual Resource

Landscape character, landscape quality (Warnock, S. & Brown, N., 1998) and “sense of place” (Lynch, K., 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 (Palmer 2000).

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 (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 (after Crawford, 1994).

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 or not they are 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 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 based on the professional assessment of the author.

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. Its determination is based upon an evaluation of each key element or characteristic of the landscape likely to be affected. The evaluation will reflect such factors such as its quality, value, contribution to landscape character, and the degree to which the element or characteristic can be replaced or substituted (Institute of Environmental Assessment & The Landscape Institute, 1996:87). The baseline for this assessment is the existing natural landscape character as described by Mucina and Rutherford (2006).

3.1.3 Sense of Place

Central to the concept of sense of place is that the landscape requires uniqueness and distinctiveness (Lynch 1992). 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 distinctive 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 (i.e. Table Mountain or the Karoo region).

Because the sense of place of the study area is derived from the emotional, aesthetic and visual response to the environment, it cannot be experienced in isolation. The landscape and cultural context must be considered. The combination of the natural landscape (mountains, streams and the vegetation) together with

the manmade structures (residential areas, roads, mining activities and power lines) contribute to the sense of place for the study area. It is these land-uses, which define the area and establish its identity.

3.1.4 Sensitive Viewer Receptors

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. This 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.

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 (scenery);
- Communities where development results in changes in the landscape setting or valued views enjoyed by the community;
- Occupiers of residential properties with views affected by a development.

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 traveling through or past the affected landscape in cars or other transport modes;
- People at their place of work.

Views from residences and tourist facilities / routes are typically more sensitive, since a view from these are frequent and of long duration and often the scenic appeal of the area is a major reason people visit the area.

Refer to Appendix A for a detailed description of the methodology used in this study. Image 1 below, graphically illustrates the visual impact process and the baseline section of it:

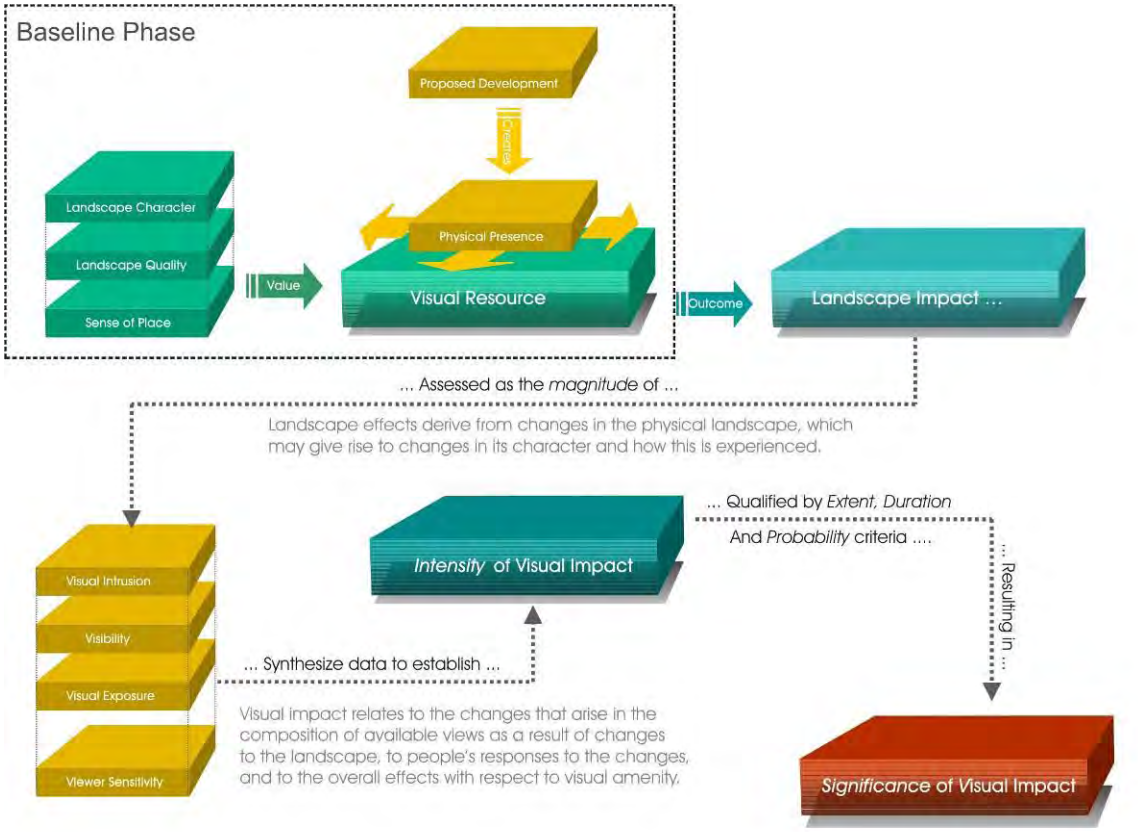


Image 1: Visual Impact Process

3.2 Methodology

The following method was used:

- 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 field survey was conducted on 14 and 15 November 2016.
- Project components: The physical characteristics of project components were described and illustrated;
- General landscape characterization: The visual resource (i.e. receiving environment) was mapped using field survey information gathered during the site visit. The description of the landscape focused on the nature of the land rather than the response of a viewer (refer to Appendix A);
- The landscape character of the study area was described. The description of the landscape focused on the nature and character of the landscape rather than the response of a viewer;
- 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.

4. DESCRIPTION OF THE PROJECT

4.1 Proposed New Expansion Projects

Some new infrastructure and expansions are proposed and described below in more detail. The list includes:

- Proposes to expand underground mining unto the farms Richmond and St George (this will have no effect on the visual environment and will therefore not be considered in the Assessment Phase
- New infrastructure at the existing mines proposed:
    - Thorncliffe mine – new Tailings Storage Facility (TSF), Waste Rock Dump (WRD) and Pollution Control Dam (PCD)
    - Helena Mine – WRD on footprint of existing TSF site as well as a new silt trap and PCD
    - Two vent shafts on the farm Thorncliffe
    - Stormwater management infrastructure associated with the above.

See also Figures 2, 2a, 2b, 2c and 2d for layouts.

4.1.1 Expansion of underground mining area

Thorncliffe, Helena and Magareng are fast approaching the end of the life of mine. After the prospecting Glencore has decided to extend the mining operation into St George and Richmond as sufficient evidence was found for viable mining. This in turn will prolong the Life of Mine (LOM) of the three Glencore Chrome mines.

4.1.2 Thorncliffe Mine TSF, WRD and RWD

A new tailings facility of 41ha is planned at Thorncliffe Mine. This facility needs to be constructed as the current TSF used for disposal after the platinum floatation process will not be large enough and additional space is therefore required. Detailed designs for the TSF are currently underway by Jones and Wagner and will be presented in the EIA.

The development of the new tailings dam will take place over two distinct phases.

A new Return Water Dam (RWD) 2.64 hectares in extent is also proposed for stormwater management at the site. A new Waste Rock Dump (WRD) of 19 hectares is furthermore proposed to the east of the TDF. This WRD was previously approved as the Tamatieland WRD in an Environmental Authorisation dated 6 June 2016 (Ref. LP30/5/1/2/3/2/1(176)EM). The footprint of this WRD however, had to be amended since the approval was received because the only available footprint for the TSF coincided with a portion of the approved WRD design footprint. An integrated design for the TSF, WRD and RWD was accordingly compiled and is included in this report for approval.

The concept layout is shown in Figure 2a.

4.1.3 Helena Mine – WRD on footprint of existing TSF site

The Helena WRD will be developed over three benches / phases. The final footprint is proposed to be 22.3 ha. This amounts to a total volume of 2 638 200 m^3. The footprint of the dump will be approximately 21 ha onto an area previously used for the Helena Paste Tailings Facility.

The development of the new Waste Rock Dump will take place in several phases as follows:

- Development – Year 1 – 4 (2017 – 2020): Deposition on the existing Helena WRD to continue
- Phase 1a – Year 5 – 6 (2021 – 2022): Construction of fist access ramp to new WRD
- Phase 1b – Year 7 – 13 (2022 – 2029): Leg / terrace 1 of new WRD deposited by conveyor
- Phase 2a – Year 13 – 14 (2029 – 2030): Construction of second access ramp to Leg / terrace 2 of new WRD
- Phase 2b – Year 14 – 21 (2030 – 2037): Leg / terrace 2 of new WRD deposited by conveyor
- Phase 3a – Year 21 (2037): Construction of access ramp to Leg / terrace 3 of new WRD and
- Phase 3b – Year 21 – 28 (2037 – 2045).

The design also includes an additional PCD of 1.5 hectares, a silt trap, stormwater management infrastructure, drainage line diversions and a conveyor transporting waste rock from Helena mine to the WRD.

The concept layout is shown in Figures 2b, 2c and 2d.

4.1.4 Vent shaft and emulsifier on the farm Thorncliffe

As underground mining expands the need arises for additional ventilation shafts and emulsifier tanks to be constructed. Two vent shafts are proposed. The first vent shaft is proposed approximately 640 m north-west of the proposed Helena WRD and will cover an area of approximately 50m x 40m (refer to Figure 2 for location). The area around the cowling will have a concrete slab. On the slab area there will also be an emulsifier. This will comprise two tanks of 23 tons each in a bunded area with a drill holes to the underground working area where the two chemicals will be mixed for the blasting that needs to be done.

Another vent shaft of approximately 30m X 30 m is proposed ±2.3 km north-northwest of the abovementioned vent shaft (970 m to the north of Mototolo Lebowa mine) along the Lebalelo water supply pipeline (see also Figure 2 for location). The vent shaft will be located next to the pipeline's servitude road but will require a short access road along the western (opposite) side of the pipeline.

LEGEND

Zone of Potential \ Influence / Study Area 3.0km about the project sites

Project Sites

NORTH

Refer to Figures 2a, 2b, 2c and 2d for detailed layouts of Thorncliffe TSF and WRD and Helena WRD,

Figure 2: PROJECT LOCAL CONTEXT

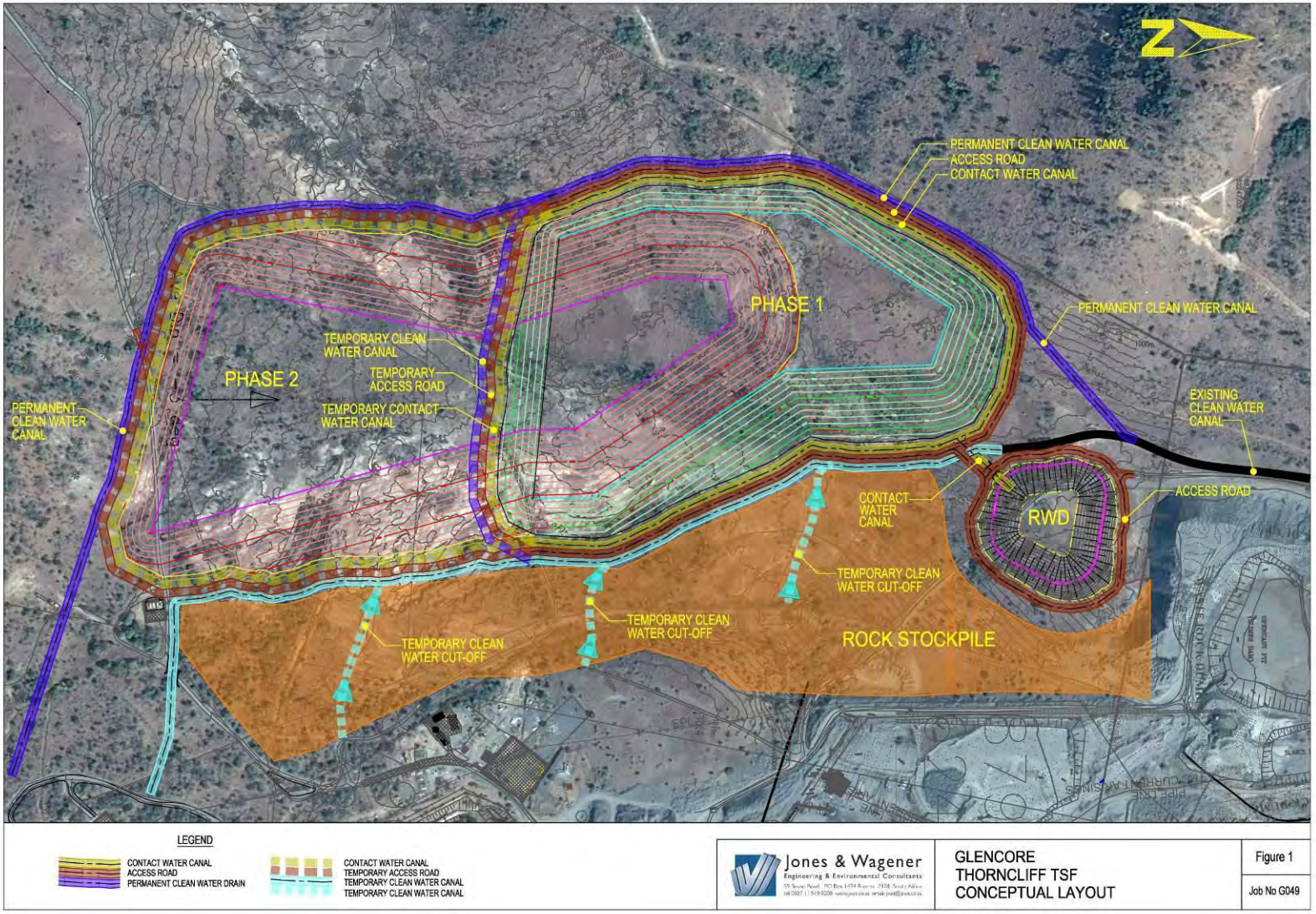


Figure 2a: PROJECT LAYOUT: THORNCLIFFE TSF

Figure 2a - 1: PROJECT LAYOUT: THORNCLIFFE TSF

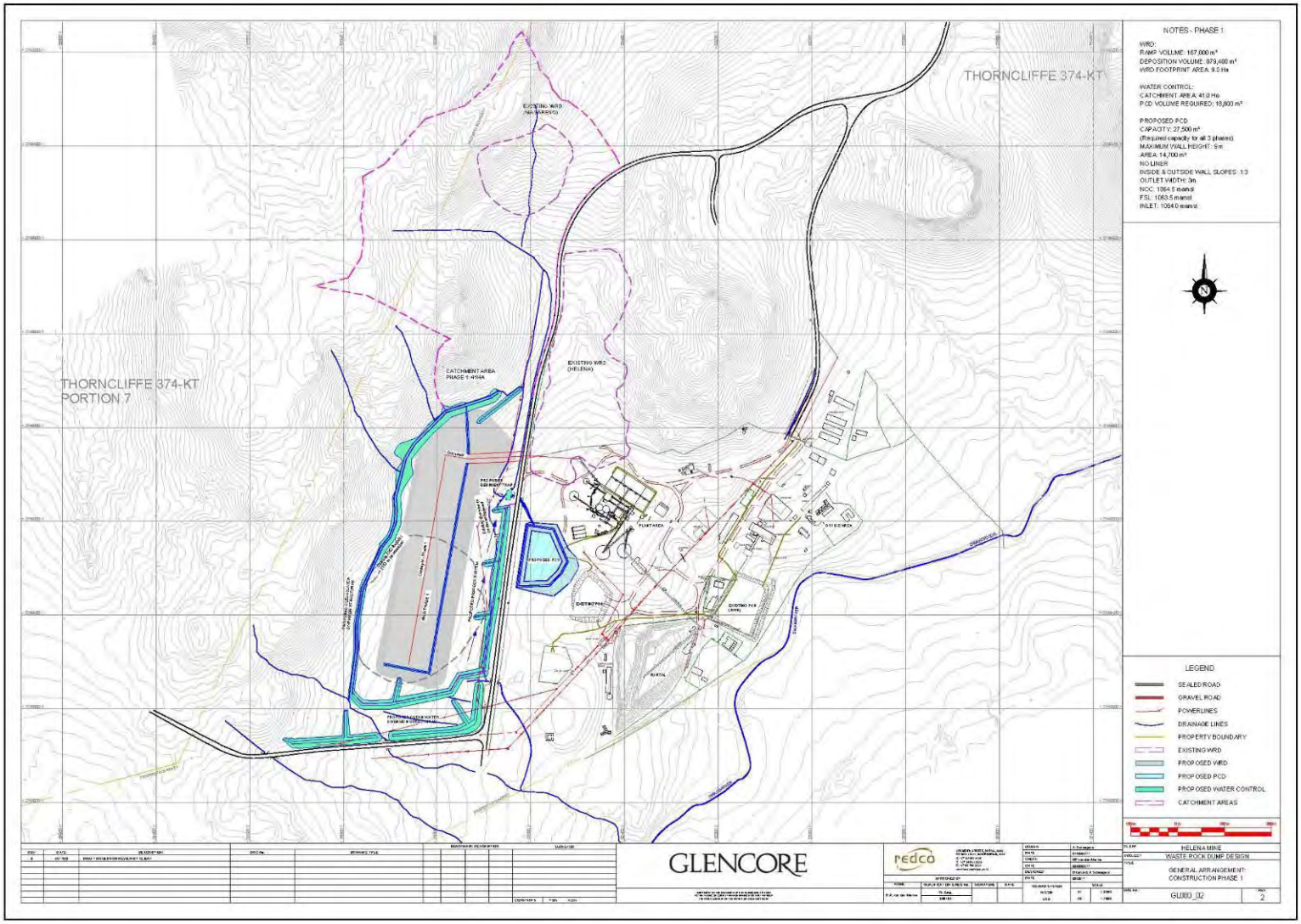


Figure 2B: PROJECT LAYOUT: HELENA WRD PHASE 1

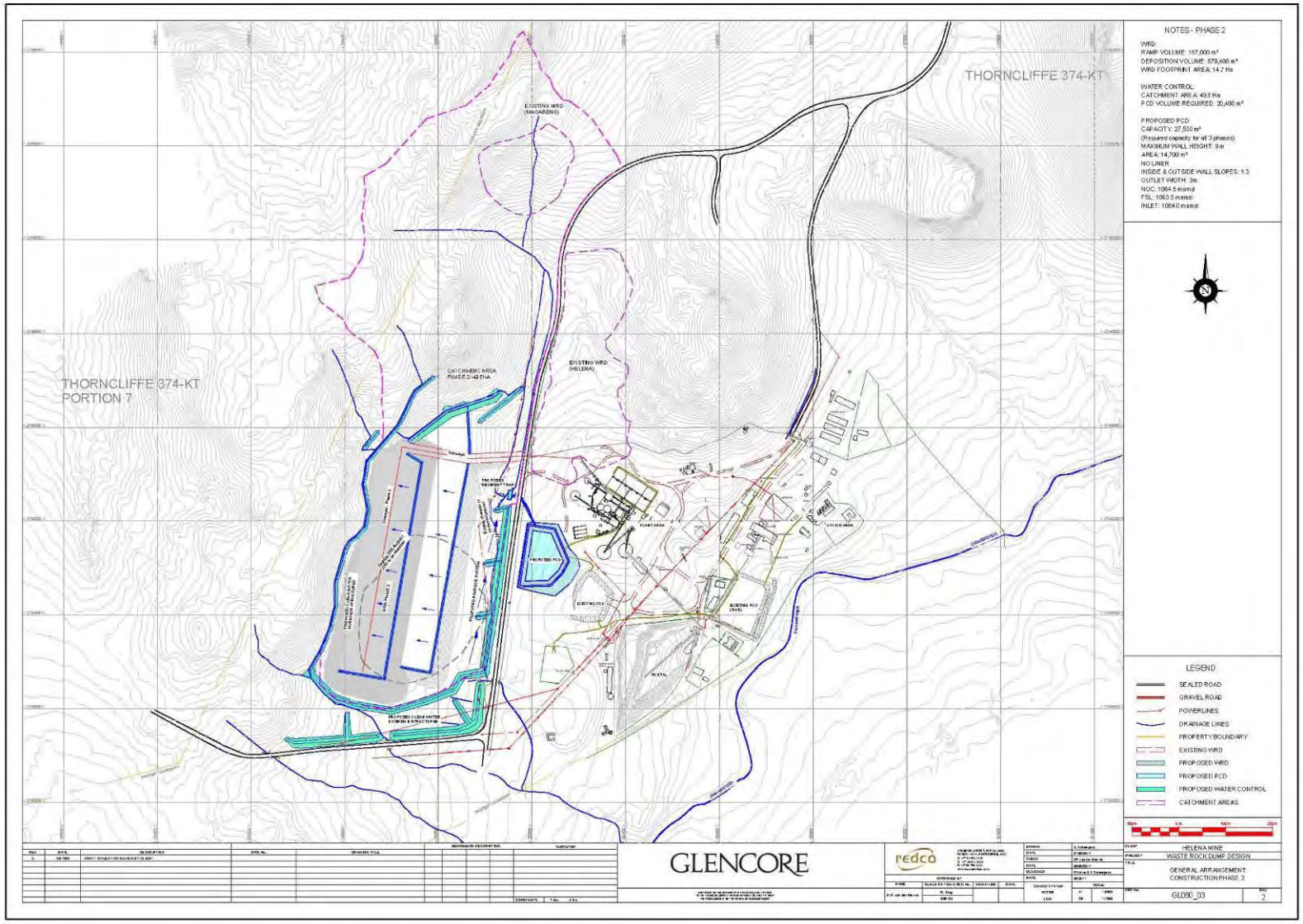


Figure 2C: PROJECT LAYOUT: HELENA WRD PHASE 2

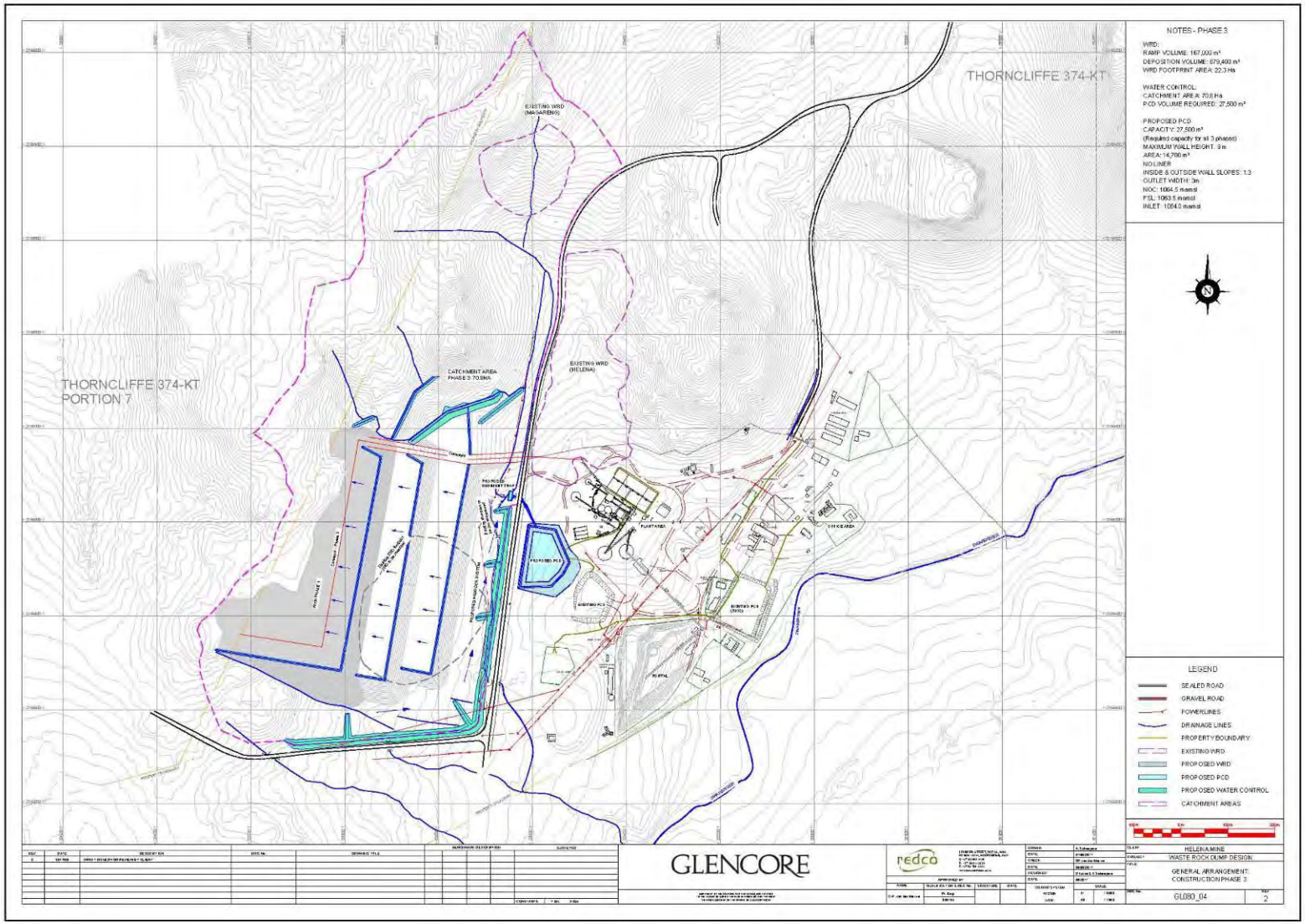


Figure 2D: PROJECT LAYOUT: HELENA WRD PHASE 3

Figure 2D-1: PROJECT LAYOUT: HELENA WRD PHASE 3

5. PROJECT ALTERNATIVES

Alternatives to the project components have not been considered in this study.

6. VISUAL ISSUES

Typical issues associated with mining operations are:

- Who will be able to see the infrastructure / facilities?
- What will they look like and will they contrast with the receiving environment?
- Will the development affect sensitive receptors (people) in the study area and if so how?
- What will be the impact of the mine be at night?
- What will the cumulative impact be given that there are currently operating mines within the study area?

These issues will be investigated in the Assessment Section of the report along with any public concerns raised in the interim.

The public participation process was conducted by Exigo Sustainability (Pty) Ltd and during this process, to date; no visual concerns have been raised.

7. THE ENVIRONMENTAL SETTING

7.1 The Study Area

For the following section, refer also to panorama views in Figures 4-1 to 4-5. The locations of the panorama view sites are indicated on Figure 3.

7.1.1 The natural landscape

The study area comprises a combination of the Sekhukhune Plains Bushveld (Dwars River and its tributaries), where most of the current mining activities occur. This landscape is the backdrop against which all cultural activities (mostly mining) occur and comprises hilly terrain covered mostly with Sekhukhune Mountain Bushveld. The Project components are located within the Sekhukhune Plains Bushveld biome (Mucina and Rutherford 2009).

The hills of the mountain bushveld biome stretch north south on either side of the proposed Project activities i.e. TDF, WRD and a vent shaft (Refer to Figure 5), and comprise:

> Vegetation & Landscape Features: Dry, open to closed microphyllous and broad-leaved savanna on hills and mountain slopes that form concentric belts parallel to the northeastern escarpment. Open bushveld often associated with ultramafic soils on southern aspects. Bushveld on ultramafic soils contain a high diversity of edaphic specialists. Bushveld of mountain slopes generally taller than in the valleys, with a well-developed herb layer. Bushveld of valleys and dry northern aspects usually dense, like thicket, with a herb layer comprising many short-lived perennials. Dry habitats contain a number of species with xerophytic adaptations, such as succulence and underground storage organs. Both man-made and natural erosion dongas occur on footslopes of clays rich in heavy metals (Mucina and Rutherford, SVcb28, 2009).

This landscape type contains several larger and small tree species and according to Mucina and Rutherford (2009) “This vegetation unit is not heavily disturbed or degraded and its vast range of habitat still harbours high plant diversity with many endemics, many of which still await formal description (Siebert et al. 2001). It is related to SVcb 27 Sekhukhune Plains Bushveld, SVcb 7 Norite Koppies Bushveld and SVcb 26 Ohrigstad Mountain Bushveld in terms of floristic diversity, species richness and vegetation structure (Siebert et al. 2002b, c)”.

The valley areas (plains) include the following:

> Vegetation & Landscape Features**:** Mainly semi-arid plains and open valleys between chains of hills and small mountains running parallel to the escarpment. Predominantly short, open to closed thornveld with an abundance of *Aloe* species and other succulents. Heavily degraded in places and overexploited by man for cultivation, mining and urbanisation. Both man-made and natural erosion dongas occur in areas containing clays rich in heavy metals. Encroachment by indigenous microphyllous trees and invasion by alien species is common throughout the area (Mucina and Rutherford, SVcb27, 2009).

Mucina and Rutherford (2009) describe this type as “This semi-arid bushveld is a disturbed and degraded system with many erosion dongas. It is related to SVcb 28 Sekhukhune Mountain Bushveld, SVcb 23 Polokwane Plateau Bushveld and SVcb 15 Springbokvlakte Thornveld in terms of floristic diversity, species richness and vegetation structure (Breebaart & Deutschländer 1997, Siebert et al. 2002b)”.

Together these landscape types and associated topographic relief form an impressive landscape setting to the study area and the proposed expansion Project.

Refer also to Figure 5, which spatially defines these vegetation units and to the panoramas in Figures 4-1 to 4-5 which illustrate the character of the study area.

7.2 Study Area Land Use

Refer to Figures 4-1 to 5, which include panoramas of the study area as well as the spatial distribution of the various landscape types (Figure 5).

7.2.1 Residential

In addition to three houses (Leshaba Community) about 1.2km east of Helena Mine, the only other formalized residential areas within the study area are the tourism facilities discussed below. A number of dwellings occur in the Klein Dwarsriver Valley to the west of the mine and study area, however people living in these would not be able to see any of the Project’s components due to the ridge line between the valley and the mining areas. Refer to Figure 3 for their location.

7.2.2 Tourism Facilities

A few tourism facilities occur to the south east of the Thorncliffe Mine. These are the Thorncliffe Gaste Plaas (which caters mostly to people visiting the mines) the Didingwe Lodge, and the Didingwe Annex. Refer to Figure 3 for their location.

7.2.3 Agriculture

The study are does not contain any active agricultural lands. However, at there are abandoned chicken breeding sheds located adjacent to the Thorncliffe Gaste Plaas.

7.2.4 Mining and Infrastructure

Mining and associated infrastructure is the main land-use activities and their actual footprint covers approximately one fifth of the study area. These activities extend primarily along the north-south valley systems as is evident in the aerial photography in Figure 2 and the yellow highlighted areas in Figure 5.

7.2.5 Roads

The main roads in the region are the R37, east of the study area and the R555 to the west. The project sites are accessed from the R555 with a local road, which cuts through the north-eastern section of the study area. The main access to the mining areas and the project sites is off this local road, which runs from north to south through the study area. This road is used mainly to access the mining activities in the study area as

well as the Thorncliffe Guest Farm and Didingwe Lodge. Refer also to Figures 3 and 6.

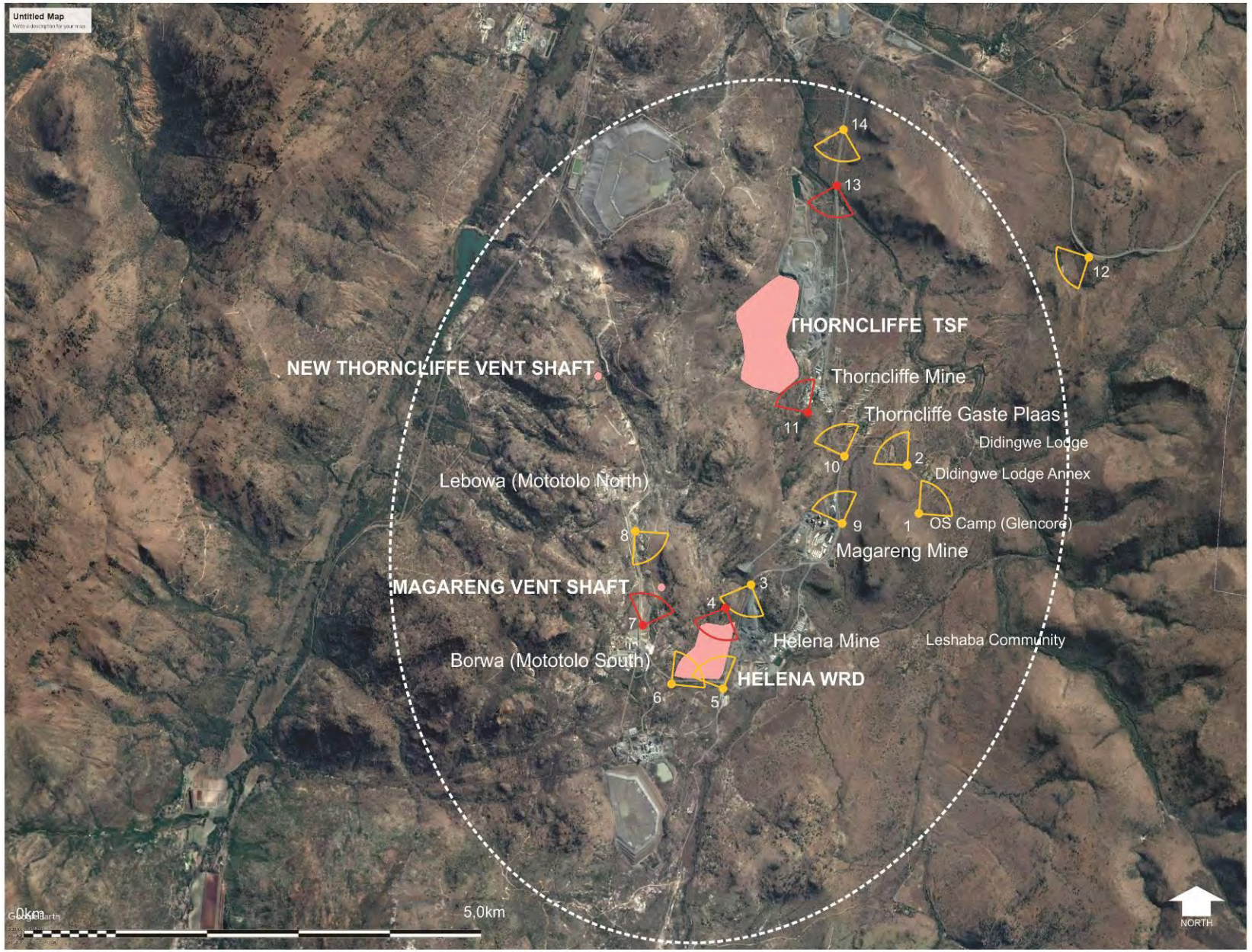
7.3 Landscape Character

Landscape character types are landscape units refined from Mucina and Rutherford (2009) vegetation types, the regional physiographic and cultural data derived from 1:50 000 topographical maps, aerial photographs and information gathered on the site visit. Dominant landform and land use features (e.g., hills, rolling plains, valleys and mining areas) of similar physiographic and visual characteristics, typically define landscape character types.

Photographic panoramas are presented in Figures 4-1 to 4-7 to illustrate the nature and character of the study area's landscape. Figure 3 illustrates the location of the viewing points and Figure 5 shows the spatial distribution of the various landscape types identified within the study area. These are:

- Natural hills and plains with no or minimal scarring
- Riverine areas associated with the Dwars River drainage system
- Tourism
- Natural hills with prospecting scars
- Abandoned agriculture
- Existing mines and associated infrastructure (power).

The landscape types are discussed in terms of their visual appeal in Section 8.0 to determine the baseline (i.e. quality of the visual resource) of the study area.



LEGEND

Zone of Potential \ Influence / Study Area 3.0km about the project sites

Project Sites

1 View Points

Direction of view

Simulation View Points

Direction of view

Site visit was carried out on 14 and 15 Nov 2016

Figure 3: VIEW SITES of PANORAMAS

Refer to Figures 4-1 to 4-5 for panorama views

NLA

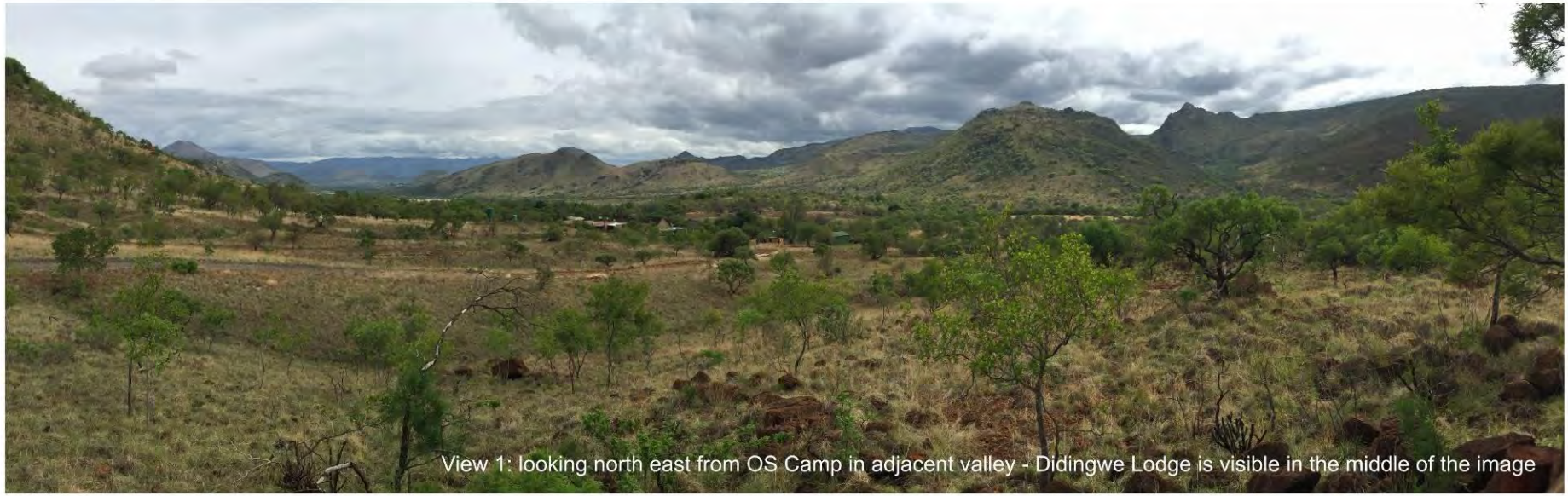


Figure 4-1: LANDSCAPE CHARACTER_Views 1 and 2

Refer to Figure 3 for location of views: Photos taken 15 November 2016

View 3 looking south towards the Helena WRD site in centre of image

View 4 looking south towards the Helena WRD site from a koppie immediately north of the site

Figure 4-2: LANDSCAPE CHARACTER_Views 3 and 4

Refer to Figure 3 for location of views: Photos taken 15 November 2016

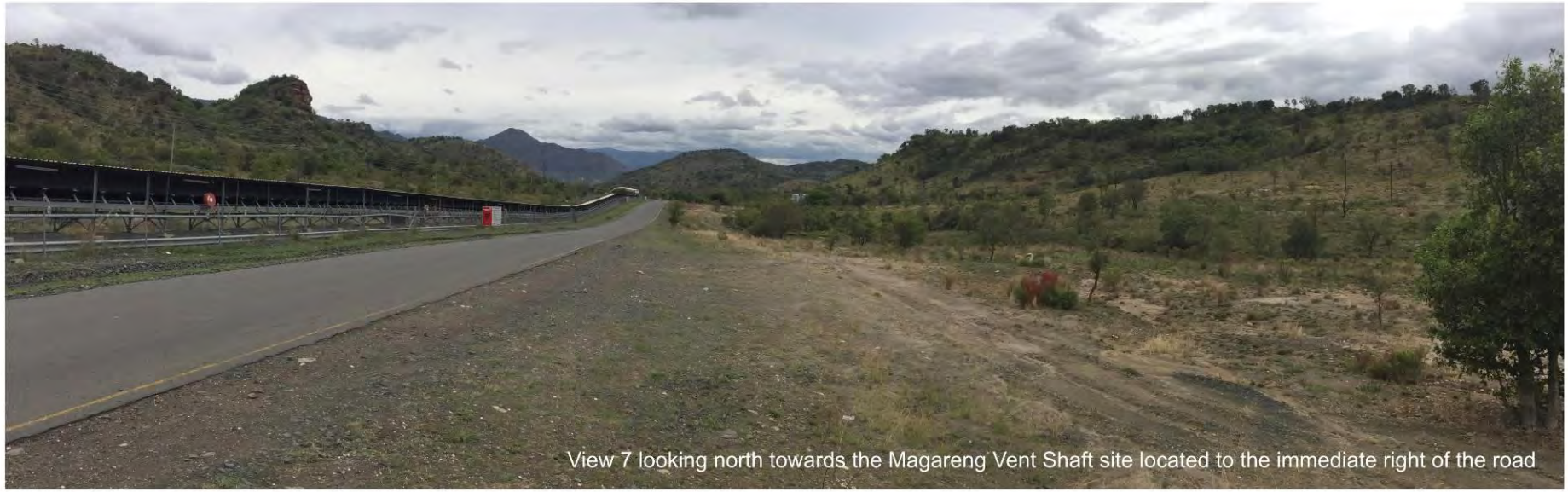
NLA

View 5 looking north towards the Helena WRD site from immediately south east of the proposed WRD

View 6 looking north west towards the Helena WRD site from immediately south west of the proposed WRD

Figure 4-3: LANDSCAPE CHARACTER_Views 5 and 6

Refer to Figure 3 for location of views: Photos taken 15 November 2016



View 7 looking north towards the Magareng Vent Shaft site located to the immediate right of the road

View 8 looking south towards the Magareng Vent Saft site located immediately to the left of the water tank in the centre of the image

Figure 4-4: LANDSCAPE CHARACTER_Views 7 and 8

Refer to Figure 3 for location of views: Photos taken 15 November 2016

NLA

View 9 looking north towards the Thorncliffe mine infrastructure from public road adjacent Magareng mine

View 10 looking north towards the Thorncliffe mine infrastructure in the center of the image

Figure 4-5: LANDSCAPE CHARACTER_Views 9 and 10

Refer to Figure 3 for location of views: Photos taken 15 November 2016

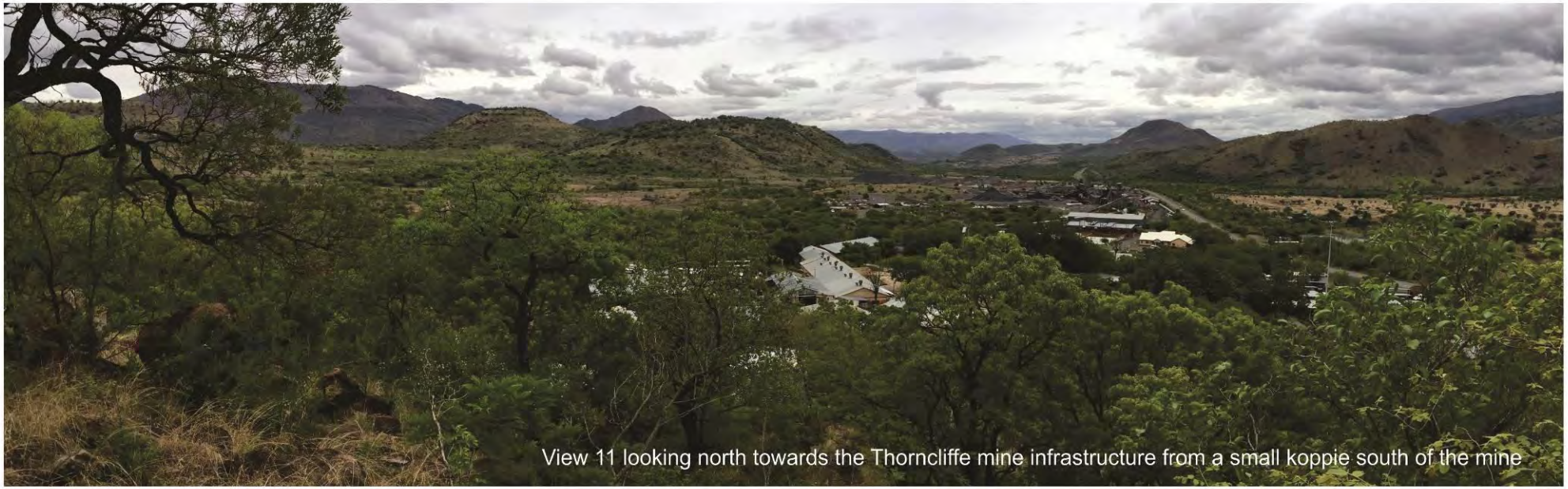


Figure 4-6: LANDSCAPE CHARACTER_Views 11 and 12

Refer to Figure 3 for location of views: Photos taken 15 November 2016

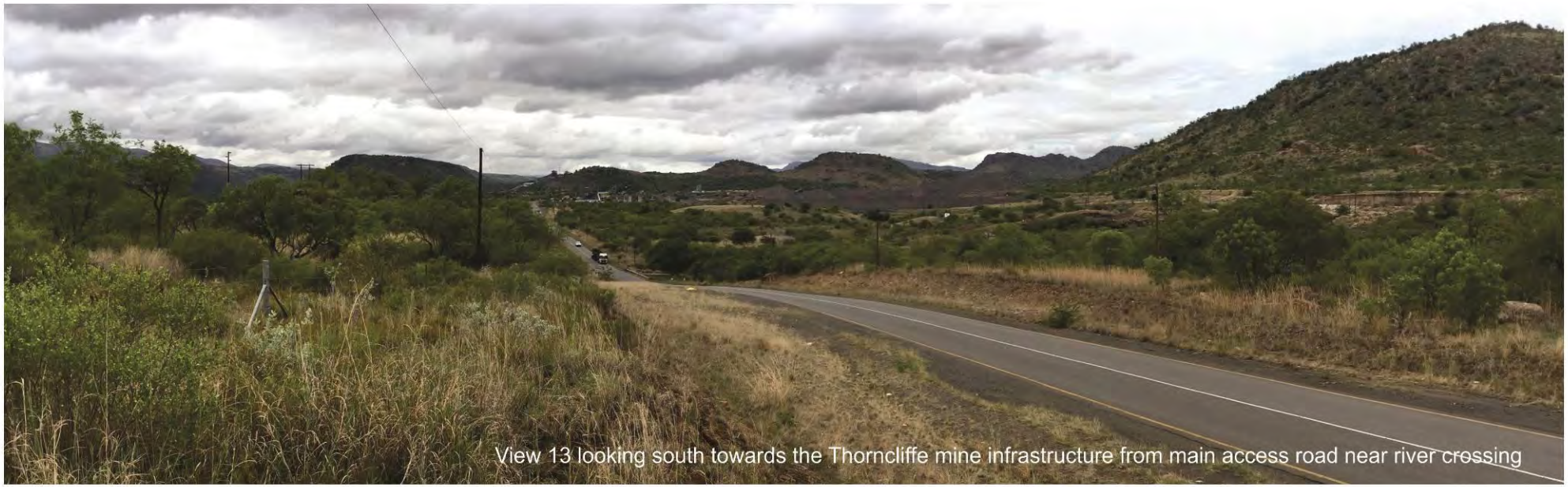


Figure 4-7: LANDSCAPE CHARACTER_Views 13 and 14

Refer to Figure 3 for location of views: Photos taken 15 November 2016

8. VISUAL RESOURCE

8.1 Visual Resource Value / Scenic Quality

The spatial distribution of the landscape types discussed in 7.3 is illustrated in Figure 5: Landscape Types and Sensitivity. The figure also rates the relative scenic quality of each landscape type and its sensitivity to intrusion caused by proposed Project activities.

Scenic quality ratings (using the scenic quality rating criteria described in Appendix A) were assigned to each of the landscape types defined in Figure 5. The *highest* value is assigned to the Natural Hills and Plains. This landscape remains relatively intact in its natural state and dominates the outer sections of the study area as illustrated in Figure 5. The panoramas in Figures 4-1 and 4-2 are good examples of the presence these hills have within the study area. This landscape type is the most sensitive to potential visual intrusion of the proposed Project activities due to its visibility and ecological integrity. The riverine areas, particularly those associated with the Dwars River in the eastern section of the study area are also considered to be visually beautiful and sensitive to potential disturbance of mining activities. It's in this valley that the Didingwe Lodge and associated lands occur.

The natural hills and tourism activities / infrastructure are of moderate scenic quality, due primarily to the impact that exploration and building activities has had on the landscape. These areas occur primarily in the central section of the study area as illustrated in Figure 5.

The mining activities have had a negative impact on the scenic beauty of the study area (illustrated in the panoramas in Figures 4-2 – 4-7) and this landscape type is of *low* scenic quality.

It is clear when one visits the project sites that prior to the impact of mining activities, the study area would have had a spectacular landscape, given the impressive mountains and the rivers and streams associated with the Dwars River system. However, when the landscape types are considered in totality, and due to the impact on this landscape of mining activities, the combination of assigned scenic quality ratings suggests an overall rating of *moderate* for the study area. This must be understood within the context of the region. Because of this rating, the study area, and particularly the landscape surrounding the Project sites, is rated moderately sensitive to change that might occur due to Project activities. A summary of the visual resource values is tabulated in Table 1 and Figure 5.

Table 1: Value of the Visual Resource
(After the Landscape Institute with the Institute of Environmental Management and Assessment, 2002)

High Natural hills and plains and riverine associated with the Dwars River and tributaries	**Moderate** Tourism and Natural Hills with prospecting scars	**Low** Abandoned agriculture and mining infrastructure
These landscape types are considered to have a *high* value because they comprise 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 importance to conserve and which has a strong sense of place. Sensitivity: It is sensitive to change in general and will be detrimentally affected if change is inappropriately dealt with.	These landscape types are considered to have a *moderate* value because they comprise a: Common landscape that exhibits some positive character but which has evidence of alteration / degradation/ erosion of features resulting in areas of more mixed character. Sensitivity: It is potentially sensitive to change in general and change may be detrimental if inappropriately dealt with	These landscape types are considered to have a *low* value because they comprise a: Minimal landscape generally negative in character with few, if any, valued features and there has been major degradation of features. Sensitivity: It is not sensitive to change in general and change

8.2 Sense of Place

The sense of place for the study area derives from the combination of all landscape types and their impact on the senses. The savannah rich and dramatic hills and valleys of the study area and region provide a dramatic backdrop to the existing mining activities and those proposed for the Project. However, the extent of mining activities contained within the valley areas severely compromises the obvious former beauty of the study area, leaving the viewer with a sense of irreversible landscape change occurring within the study area.

Furthermore, the nature of the primary landscape types focusses the senses on the mountains, resulting in a keen sense of place, which has a distinct natural character despite the existing mining activities. This is evident in the panoramas in Figures 4-1 and 4-2.

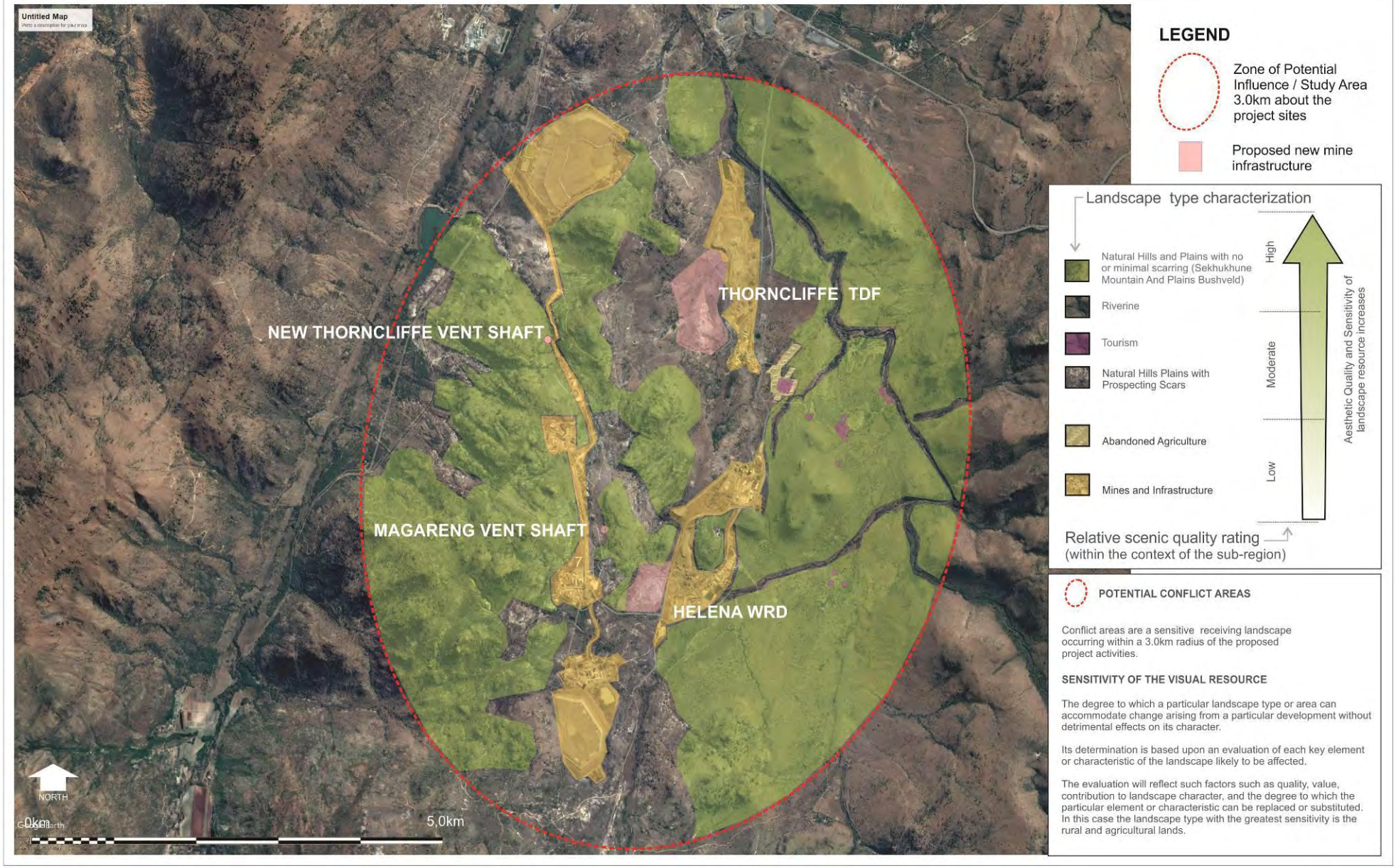


Figure 5: LANDSCAPE TYPES AND SENSITIVITIES

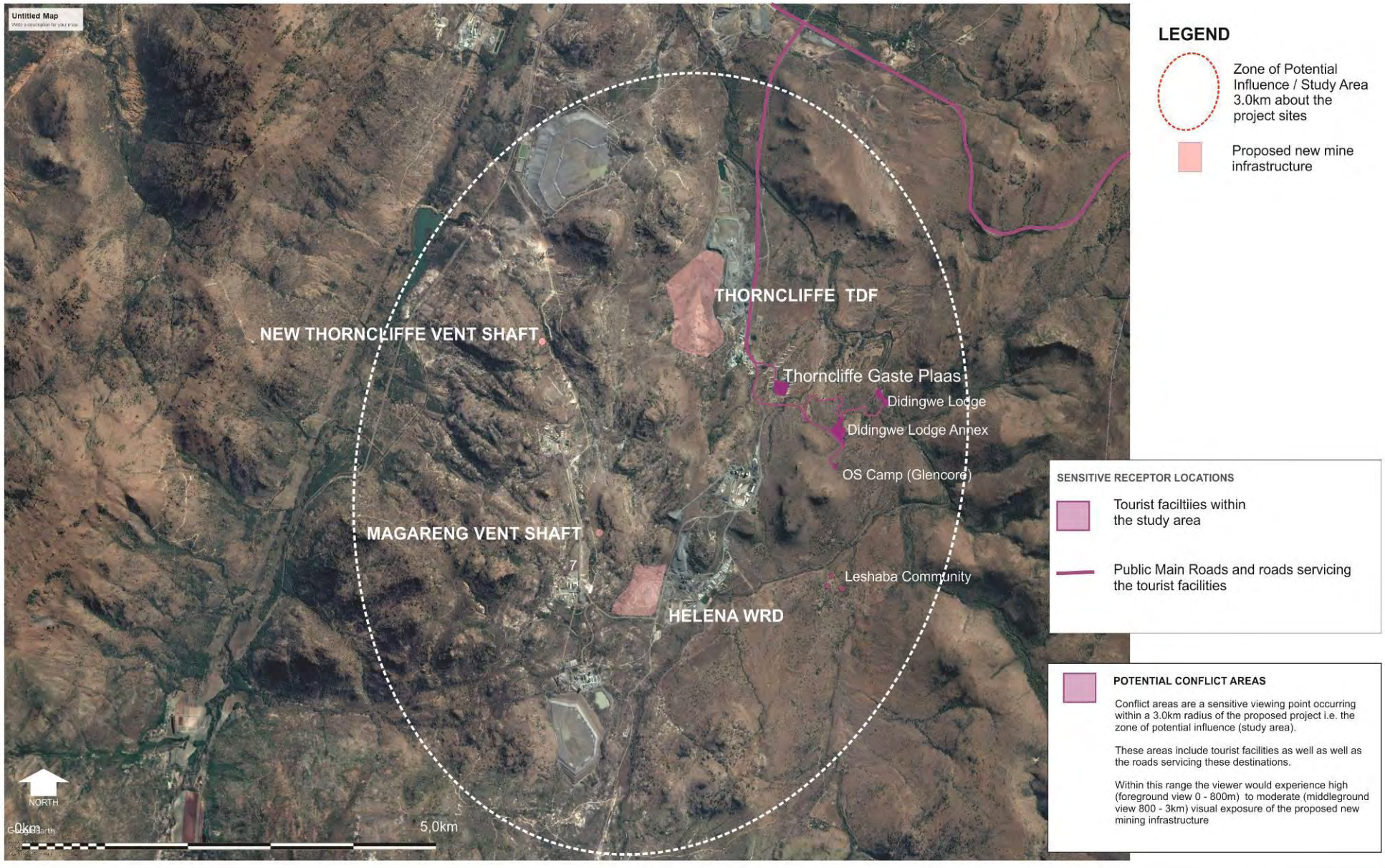


Figure 6: VIEWER SENSITIVITIES

9. VISUAL RECEPTORS

9.1 Views

Visual receptors include people travelling along the R555 connector road in the north-east sector of the study area as well as the local road within the study area, which is the main access route to the mining areas as well as the Thorncliffe Gaste Plaas and the Didingwe Lodge. Refer also to Figures 3 and 6. The remaining receptors would be people traveling to and from the mining areas, who would not be sensitive to mining activities.

9.1.1 Sensitive Viewers

Within the context of the study area and the region, the following receptors (Table 2) were identified as potential sensitive viewers during the site visit. Refer also to Figure 6, which identifies their location relative to the Project site and the anticipated sensitivity to the proposed Project.

Table 2: Potential Sensitivity of Visual Receptors – the Project

High	Moderate	Low
People living at or visiting Didingwe Lodge and Annex, Thorncliffe Gaste Plaas and the Leshaba Community as views from these tourist and residential properties could be affected by the expansion project.	Locals and visitors travelling through the study area on the R555 connector road north-east of the study area	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. VISUAL ISSUES

The receiving landscape that may be affected by the proposed Project has been described above. The study area's scenic quality (baseline) has been rated *high* (undisturbed natural hills) to *low* (mining areas) (Figure 5). Sensitive viewing areas (Figure 6) and landscape types (Figure 6) have been identified and mapped indicating potential visual sensitivity to the proposed expansion Project. The most sensitive are the tourist areas associated with the Didingwe Lodge, however, most activities are screened from views from this property, which is located in a valley. In the following chapters the impacts on the visual resource and sensitive receptors using also modelling techniques to establish visibility (viewshed analyses) and intrusion (simulations), will be assessed.

Impacts on 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 i.e. tourists visiting an area due to its scenic beauty. Visual impacts within the study area will occur when changes in the landscape are noticeable to viewers looking at the landscape from tourist facilities (Didingwe Lodge) and public travel routes, especially when the activity would appear in foreground views.

It is anticipated that visual resource (landscape and views) impacts would result from the construction and operation of the proposed expansion Project activities. Specifically, impacts would result if the Project's activities could be seen from sensitive viewing areas (Didingwe Lodge and associated game viewing roads) as well as the access road to the lodge and Thorncliffe Gaste Plaas. In assessing the worst-case scenario (combined impact of all three activities i.e. the vent shafts, Thorncliffe TDF and Helene WRD) and rating the impacts using the matrix in Appendix D, the following issues will also be considered:

- Establish public concern for Project specifically as it concerns visual issues (through Exigo);
- Determine the visibility of the proposed Project activities using viewshed analyses;
- Determine visual intrusion (contrast) of the proposed open pit expansion project by simulating its physical appearance from selected sensitive viewing areas;
- Rate the impact of the Project on views from sensitive viewing areas (worst case scenario); and
- Establish management measures (mitigation) to reduce the impact of the Project where possible or appropriate.

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11. LANDSCAPE IMPACT

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 project is predicted to be *moderate* to *low* due to effect of the project's activities, as described in Section 4, on the various sites. Earth moving activities to create the 'platforms' for the various activities will remove some vegetation and expose earth that will contrast with the darker hues of the existing hill landscape. However, as there are numerous mining activities within the study area and the fact that the proposed activities (TSF, WRD and the shaft complexes) will be viewed within a visual envelope that includes these activities, the landscape impact will have a cumulative impact on the landscape as is evident in the simulations in Figures 12 – 15, and not stand out as a focal point in the landscape.

As stated in the approach section, the physical change to the landscape (landscape impact) must be understood in terms of the visibility of the proposed new mining activities (impact on sensitive viewers) and its effect on the aesthetics of the study area (intensity of impact on the baseline visual resource). The following sections discuss the effect that the expansion project could have on the visual and aesthetic environment.

Visual impacts will be caused by the Project's activities in all project phases i.e. construction, operational, decommissioning and closure. The activities associated with the expansion project, will mostly be visible during the day, to varying degrees from and from a variety of distances and perspectives around the project site. During start up and operation the project's visibility will be influenced by the increase of earth moving activities, removal of vegetation and the creation of dust. During decommissioning and closure phases, the visual features of the TSF and WRD will be influenced by the success and effectiveness of the proposed rehabilitation measures.

In order to determine the significance of visual impact, it is first necessary to establish the intensity of impact of the various activities. The *intensity* of visual impact is determined using visibility, visual intrusion, visual exposure and viewer sensitivity criteria. When the *intensity* of impact is qualified with spatial, duration and probability criteria the significance of the impact can be predicted. *Consequence* is a function of intensity, spatial extent and duration and *significance* is the function of consequence and probability. Refer also to Appendix D (Exigo criteria) and Figure A.

12.1 Visual Receptors

Areas and sites considered potentially sensitive to project activities in the study area are public roads, settlement areas (residential areas) and tourist activities. Figure 6 identifies these places relative to the project sites where potential conflict could occur i.e. visibility of the mining activities impact on sensitive viewers. Typically, high receptor sensitivity, includes people using outdoor recreational / tourism facilities, public rights of way and residents of housing areas, whose intention or interest may be focused on the landscape; medium sensitivity relates to people engaged in outdoor sport or recreation (other than appreciation of the landscape); and low sensitivity would 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, industrial areas and active sports such as soccer). Refer also to Appendix B.

Most sensitive viewer sites are located in a cluster to the east of Thorncliffe and Magareng mines as well as three houses associated with the Leshaba Community, located directly east of the Helena Mine. These locations are illustrated in Figure 6. Included in the area east of the Thorncliffe Mine, are the Thorncliffe Gaste Plaas, Didingwe Lodge and Annex and the OS Camp owned by Glencore Mine. The most sensitive of these is the Didingwe Lodge and Annex as it attracts tourists visiting the area.

The Thorncliffe Gaste Plaas, whilst it might also cater to tourists from time to time, frequently caters to business people and consultants visiting the mines. This site is therefore not considered sensitive to visual impact. In addition, it would only be the upper parts of the Thorncliffe TSF that would ultimately be seen from the Gaste Plaas in the latter stages of the project cycle. The OS Camp is owned by Glencore and people visiting it would not be sensitive to mining activities. None of the proposed mining activities would be visible from this site (Figure 11).

Panoramic views, 1 and 2, illustrated in Figures 4-1 are taken in this general area east of the Project sites and illustrate that mining activities are mostly obscured from the lodging facilities due to a ridge line running between the mines and the tourist area.

The main Steelpoort road is elevated and runs to the north-east of the mining areas. It is also considered a sensitive viewing location. However, for the most part, views from the road to the proposed new mining facilities are hidden from view as is illustrated in the viewshed in Figure 11. Only the Thorncliffe site is visible from a small section of the road as illustrated in the viewshed.

The main access road to the mining areas is not considered sensitive as it regularly carries mining related traffic.

12.2 Visibility, Visual Exposure and Visual Intrusion

The 'zone of potential influence' was established at 3km (Figure 1). Over 3km the impact of the proposed expansion project and associated activities would have reduced due to the diminishing effect of distance, atmospheric conditions (haze) on visibility and topography. The study area is contained within the Dwars River valley systems and therefore views to the project sites are limited. Visual exposure is determined by qualifying the view with a distance rating to indicate the degree of potential intrusion and visual acuity.

12.2.1 Visibility

In determining the visibility of the Project, various offsets were to generate the viewshed analyses in Figures 7 – 11). It can be seen from the patterns generated by the viewsheds that the proposed project operations would be visible across approximately 60 percent of the study area and that some of the sensitive viewing areas (Figure 11) would also be impacted.

It must be understood that these patterns represent *potential* viewing sites and illustrate the worst-case scenario i.e. the landscape without vegetation. It is therefore imperative that the viewsheds be interpreted in terms of the site visit findings as illustrated in the panoramas in Figures 4-1 to 4-7, the simulations in Figures 12 - 15 and the fact that the study area consists of severely undulating topography with mostly savannah cover. Due to these factors, the most sensitive of the tourist viewing areas (i.e. the Didingwe lodge and Annex) do not have views to any of the proposed Project components (Figure 11). However, the western sections (game viewing areas) of the property would be only be exposed to the Thorncliffe TSF in its final years of operation when it begins to protrude above existing mining infrastructure, but only from openings in the savannah and not generally as is indicated in the viewshed. It should also be noted that only the Thorncliffe TSF is potentially visible from these areas east of the site. And all views to the TSF would have the existing mine infrastructure at their base.

People living in and visiting Leshaba Community would be able to see (Figure 8) the Helena WRD, but most of the views would be partially or totally blocked by existing vegetation. It should be noted that a TSF is being proposed to the immediate south of the Community (SLR 2015), which would have a greater visual

impact on this community that the Helena WRD.

The two shaft sites and the Helena WRD are not visible to any of the identified sensitive viewing areas. as illustrated in the viewsheds in Figures 8 – 10.

12.2.2 Visual Exposure and Sensitivity

Table 3 below indicates the potential visual exposure of the sensitive viewing areas. 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. Visual exposure is considered *high* when the expansion Project's activities are visible foreground views and would contribute greatly to the intensity of visual impact. *Moderate* exposure is considered for middle-ground views and *low* exposure for background views.

Table 3: Visual Exposure of Project Components

	Foreground view i.e. 0 – 0.8km to a Project Site	Middle-ground view i.e. 0.8 - 3km to a Project Site	Background view i.e. 3km and beyond a Project Site
Public roads (main Steelpoort road)	None	None	Small section of the road would provide views to the upper levels of the Thorncliffe TSF
Tourist areas (Didingwe Lodge and Annex)	None	Western sections of Didingwe Lodge property would have views to the upper levels of the Thorncliffe TSF	
Leshaba Community	None	Homesteads would have partially screened views towards the Helena WRD	

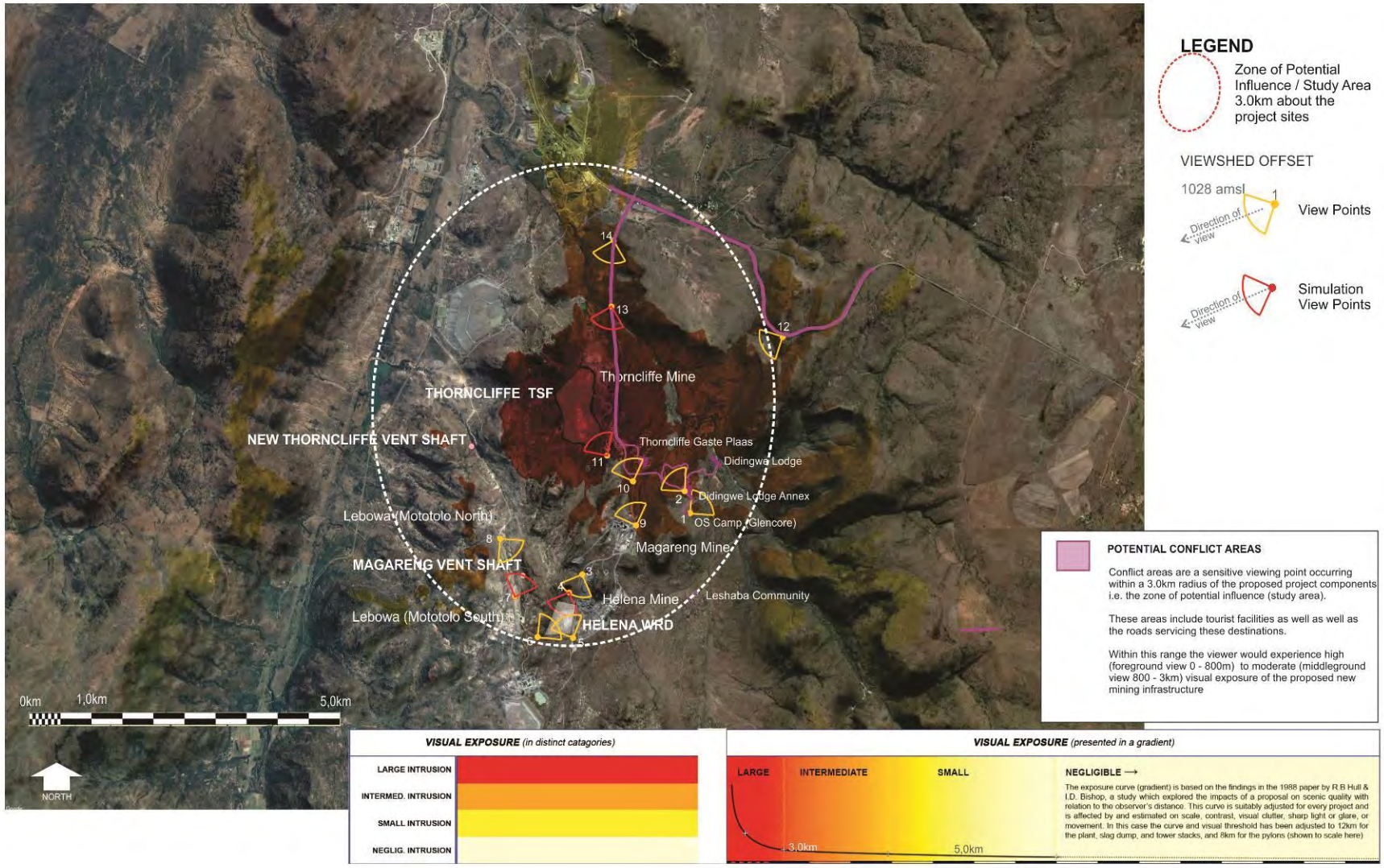

Figure 7: VIEWSHED_THORNCLIFFE TSF

Refer to Figures 4-1 to 4-6 for panorama views

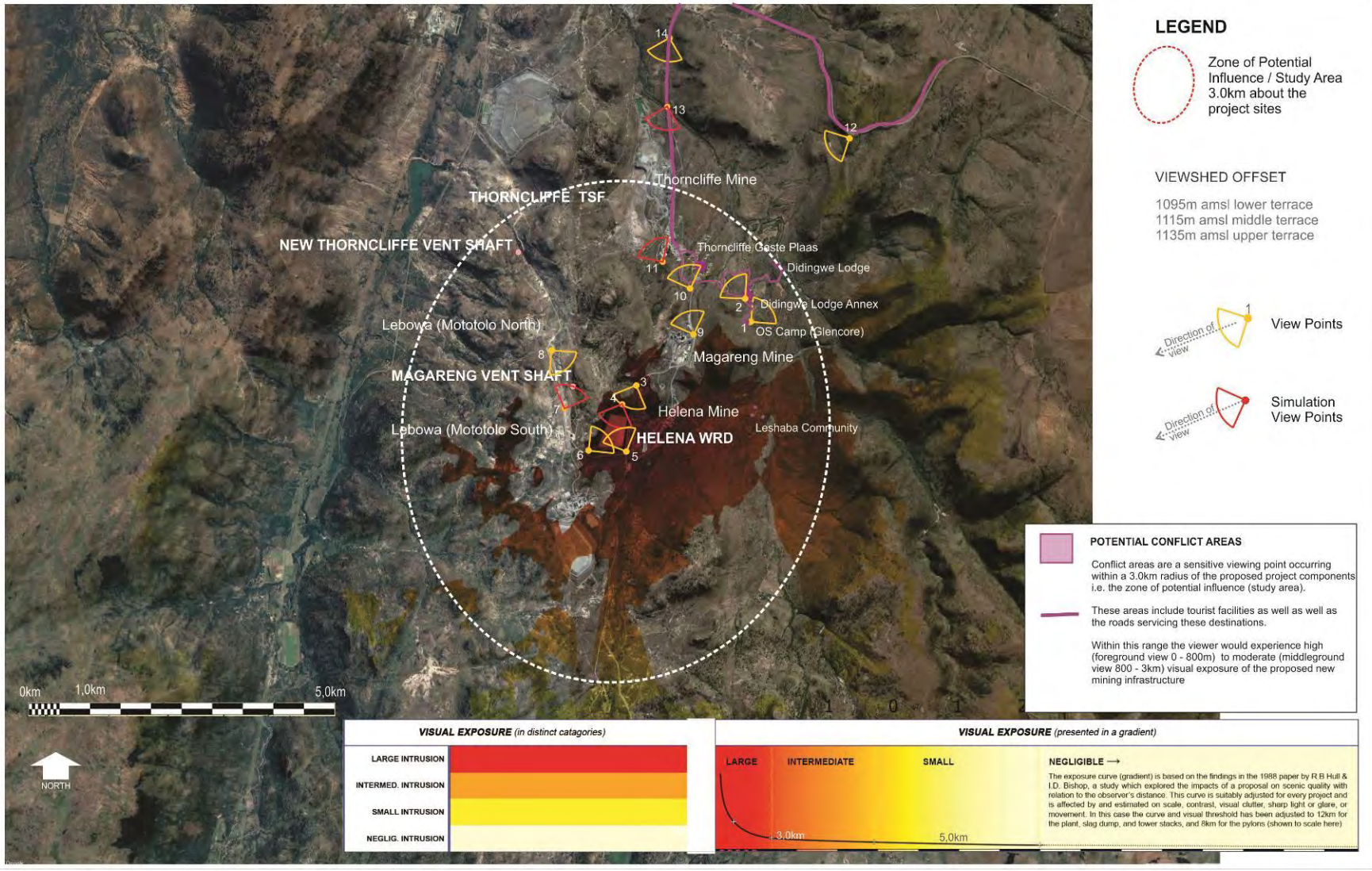

Figure 8: VIEWSHED_HELENA WRD

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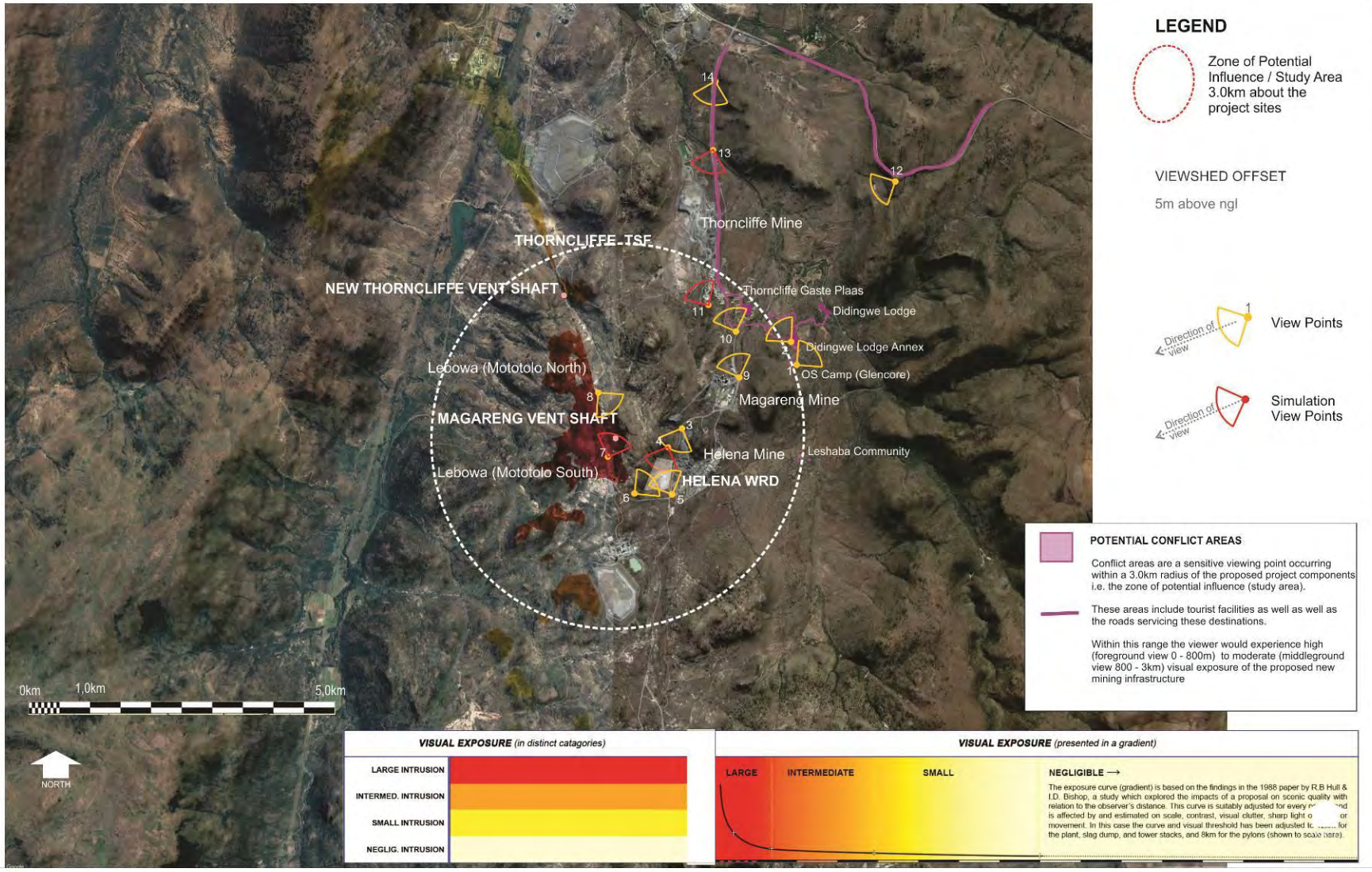

Figure 9: VIEWSHED_MAGARENG SHAFT COMPLEX

Refer to Figures 4-1 to 4-6 for panorama views

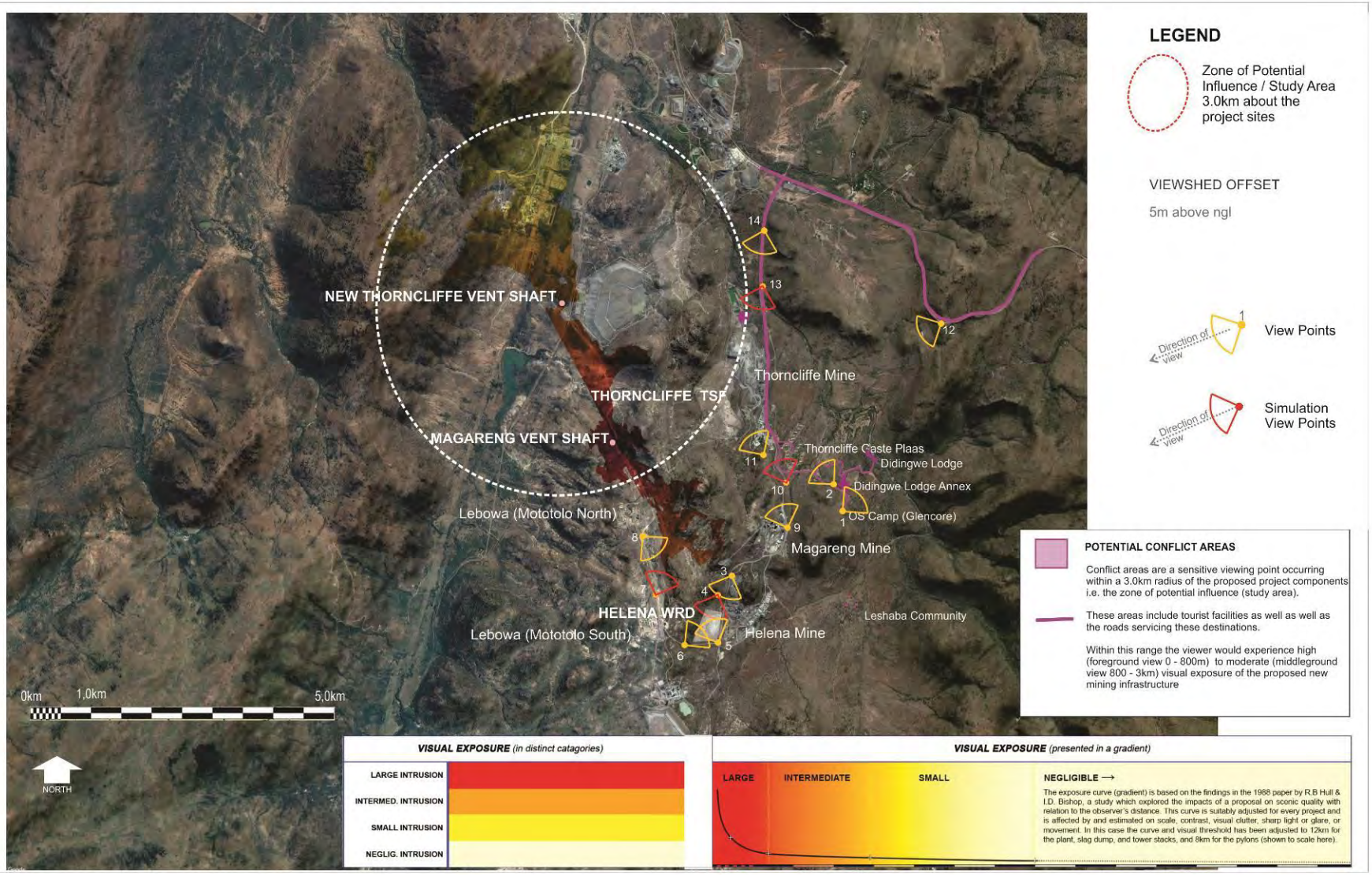

Figure 10: VIEWSHED_NEW THORNCLIFFE SHAFT COMPLEX

Refer to Figures 4-1 to 4-6 for panorama views

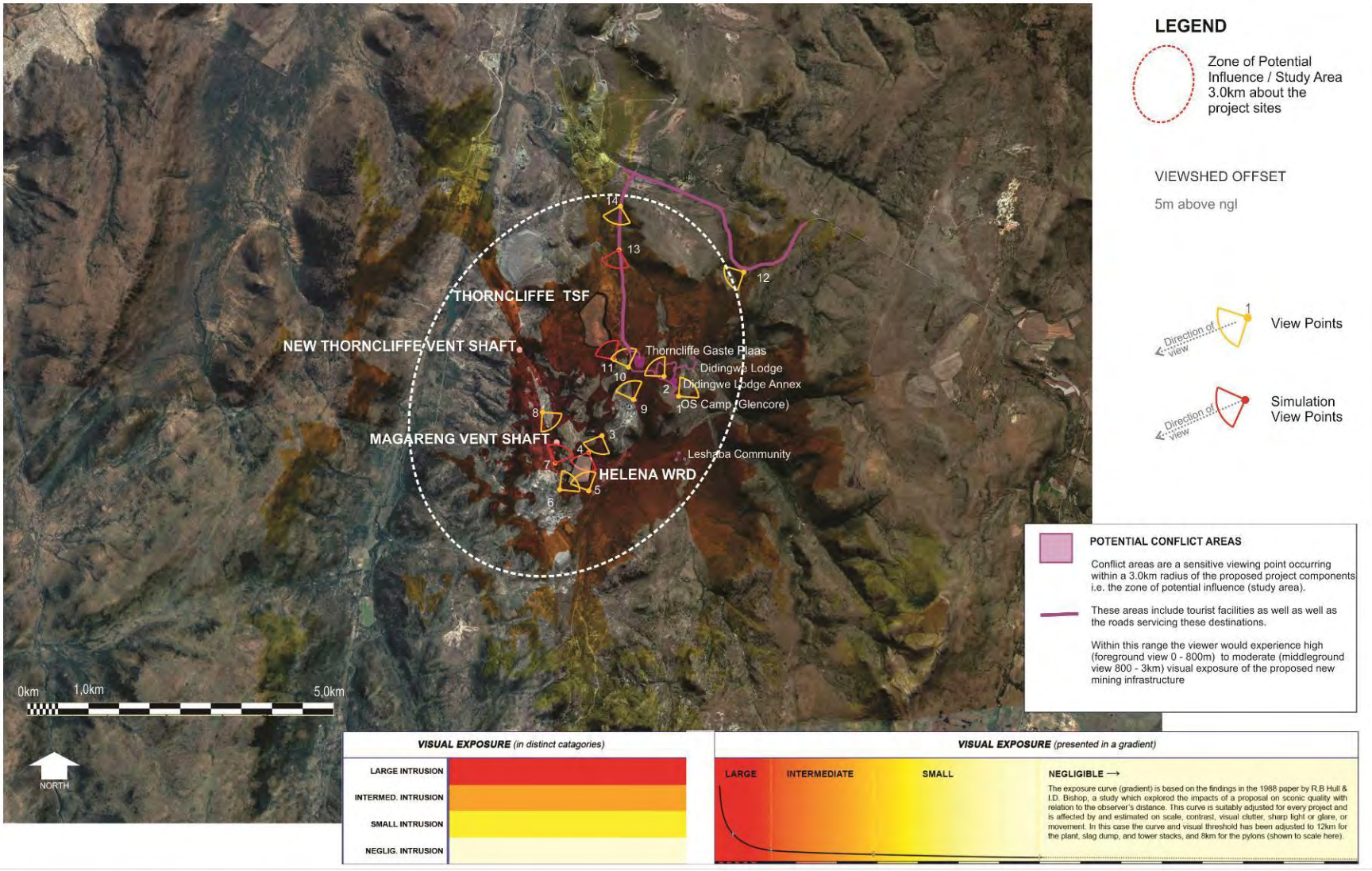

Figure 11: VIEWSHED_COMBINED ALL NEW FACILITIES

Refer to Figures 4-1 to 4-6 for panorama views

12.2.3 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?

The simulations in Figures 12 – 15 illustrate the effect that Project Components will have on the visual landscape when viewed from a variety of locations about the study area. The simulations illustrate views from within the mining areas toward the new facilities. Figures 12 and 13 are focused towards the TSF, Figure 14 illustrates a close-up view of the Helena WRD and PCD and Figure 15 illustrates the proposed Magareng Vent Shaft from an internal mining road.

No simulations have been done for views from Didingwe Lodge as project components are not visible from it and its immediate environs. The simulations are therefore being used to indicate the nature, form and scale of the proposed expansion activities. Visual intrusion is considered *low* for all project components because they are mostly compatible with the cultural aesthetic of the area (mining dominated) and thus minimal disruption to the visual aesthetic of the landscape when viewed from within tourist areas and sensitive residential areas. The only affected areas are the Didingwe Lodge game viewing areas and the homesteads associated with Leshaba Community.

Table 4: Visual Intrusion of Project Components

High	**Moderate**	**Low** **Didingwe Lodge Game Viewing Areas and Leshaba**
The proposed expansion 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 proposed expansion project would have a negative effect on the visual quality (sense of place) of the landscape; - 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 (mining), settlement or enclosure patterns of the general area;	The proposed expansion project would have a minimal effect on the visual quality (sense of place) of the landscape; - Contrasts minimally with the patterns or cultural elements that define the structure of the landscape; - Is mostly compatible with land use, settlement or enclosure 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 change to key views from the Didingwe Lodge Game Viewing areas, the Steelpoort Road and Leshaba**

Figure 12: SIMULATION_THORNCLIFFE TSF_View 14

Refer to Figure 3 for location of views: Photos taken 15 November 2016

Figure 13: SIMULATION_THORNCLIFFE TSF_View 11

Refer to Figure 3 for location of views: Photos taken 15 November 2016

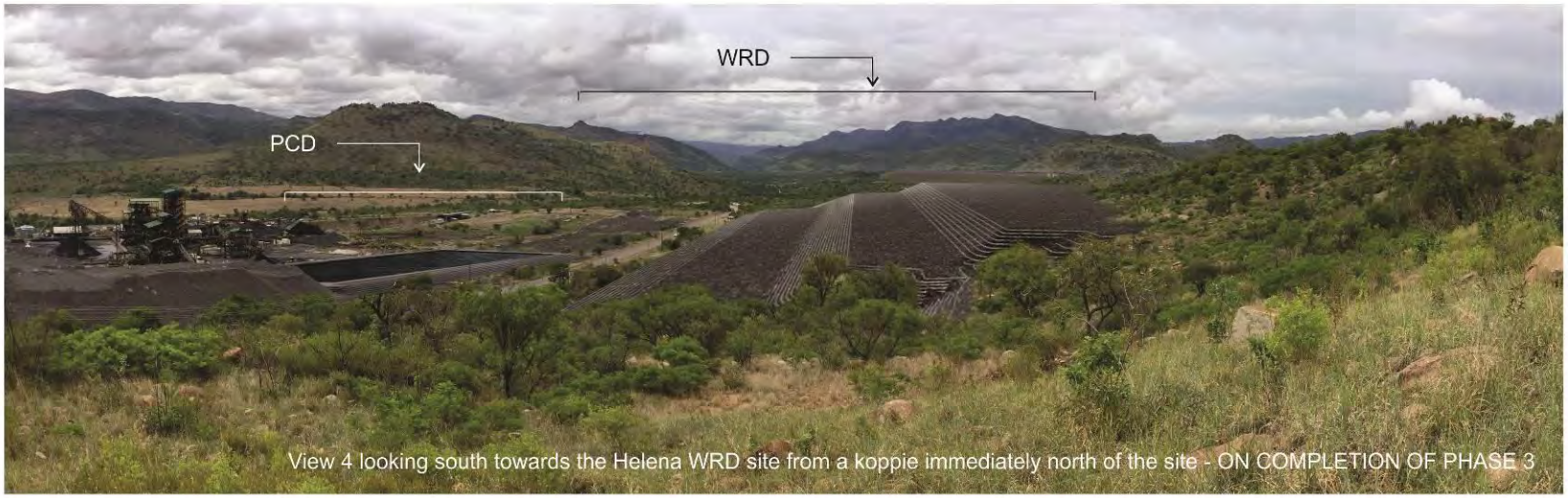

Figure 14: SIMULATION_HELENA WRD_View 4

Refer to Figure 3 for location of views: Photos taken 15 November 2016

Figure 15: SIMULATION_MAGARENG VENT SHAFT View 7

Refer to Figure 3 for location of views: Photos taken 15 November 2016

12.2.4 Intensity of Visual Impact

Referring to discussions in Section 12.2 above and using the sensitivity criteria listed in Table 2, the visual intrusion and *intensity* of visual impact of the expansion project is rated using the four main factors:

- *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

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

The *intensity* of visual impact is rated in Table 5 below. Refer also the intensity ranking table in Appendix D.

Table 5: *Intensity* of Visual Impact

High No Sensitive Areas	Moderate No Sensitive Areas	**Low** **Didingwe Lodge game viewing areas and Leshaba homesteads**	**Negligible** **Steelpoort Road**
The expansion project will cause a major alteration to key elements/features/ characteristics of the baseline through the introduction of elements considered to be uncharacteristic when set within the attributes of aspects of the current and future receiving landscape. Result: High scenic quality impacts would result as well as impacts on sensitive viewing areas.	There will be a partial loss of or alteration to key elements/features/ characteristics of the visual and landscape baseline. I.e. The introduction of project elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes of the receiving landscape. Result: 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. **Result:** **Low scenic quality impacts would result on sensitive viewing sites**	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 are not uncharacteristic with the surrounding landscape – approximating the 'no change' situation. **Result:** **Negligible scenic quality impacts would result on sensitive viewing sites.**

The *intensity* of impact (using the worst-case scenario) is therefore predicted to be *low* to *negligible* for all phases of the Project on sensitive tourist and residential areas.

13. MITIGATION MEASURES

In considering mitigating measures there are three rules that were 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 considered:

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

13.1 Project Area Development

- It is proposed that as little vegetation as possible be removed during the start-up and operational phases for all project sites.
- Ensure, wherever possible, all existing natural vegetation is retained and incorporated into the project site's rehabilitation.

13.2 Earthworks

- Dust suppression techniques should be in place at all times during all phases of the expansion project.
- Only the footprint and a small 'construction buffer zone' around the proposed project sites should be exposed. In all other areas, the natural vegetation should be retained.
- Topsoil should be applied to all TSF, PCD, RWD and WRD slopes.

13.3 Rehabilitation

- It is imperative that the disturbed areas be effectively rehabilitated back to the natural vegetation associated with the Sekhukhune Plains Bushveld Biome. This is to reduce the excessive contrast created between the exposed earth with the dark hues of the existing landscape.
- A registered Professional Landscape Architect, working alongside the project ecologist should be appointed to assist with the rehabilitation plan for the project.
- Rehabilitate / restore exposed areas as soon as possible after mining activities are complete.
- Only indigenous vegetation should be used for rehabilitation / landscaping purposes.
- The WRD and TSF should be shaped such that the final contour blends with the existing topography and water is drained away from the newly top-soiled and hydroseeded slopes to avoid erosion during the rehabilitation period.

- Where slopes compatible with the surrounding landscape can be achieved, an attempt should be made to visually soften steeper slopes by avoiding strait engineered ridges and sharp changes of angle;
- Grass seeding of the slopes should be undertaken to emulate the groupings of natural vegetation in nearby hills.

13.4 Lighting

Lighting can contribute to night time light pollution, especially in areas where there are not many other light sources. However, in the case of the Project all expansion activities will take place in the vicinity of other existing mining activities where light sources are evident. Therefore, the additional light caused by the proposed activities will add to the cumulative effect of night lighting within the study area but will not significantly increase the impact of existing mining activities. However, management measures must be taken for all new lights introduced by the project. Refer to Section 13.4.

The *Intensity* of impact, rated in Table 5, is further qualified with *extent*, *duration* and *probability* criteria to determine the *significance* of the visual impact (refer also to Appendix D). Table 6 below summarises the *significance* of the visual impact during the Operational Phase. Table 7 summarises the *significance* of impact during the Closure and Decommissioning phase and Table 8 rates the *significance* of impact at Post Closure. These results are based on the worst-case scenario when the impacts of all aspects of the expansion project are taken together using the impact criteria in Appendix D and the Master Plomp Impact Matrix in Appendix F.

The unmitigated impact for the Operational Phase (includes the start-up to the project) is rated *low significance*. This impact will occur when major earth movement and other project activities (removal of vegetation, creation of development 'terraces'; movement of trucks; and lighting of the area including security lighting) associated with the Thorncliffe TSF and Helena WRD operations, are partially visible to sensitive viewing areas (Didingwe Lodge and Leshaba). Mitigation will be difficult during this period and the rated impact would not drop significantly even with management measures such as good housekeeping and dust suppression techniques.

At Closure and Decommissioning, when the final grading is carried out and topsoil is deposited on the graded areas and then hydroseeded, the impact without mitigation is rated *low significance* assuming the project areas will have been rehabilitated with effective dust suppression techniques and the successful growth of plant material.

At Post Closure, the impact will remain *very low significance*. Without mitigation this process (establishment of vegetation) will take longer that with successful and effectively managed rehabilitation techniques.

Table 6: Summary of the visual impact per phase of the project
OPERATIONAL PHASE

Potential Visual Impact	ENVIRONMENTAL SIGNIFICANCE					
	Probability	Duration	Scale	Intensity	Significance	Mitigation effect
Alteration to the visual quality of the study area due the removal of vegetation, topsoil the creation of 'terraces' to accommodate the various project components. The result is a cumulative impact that contributes to the already altered visual quality and sense of place of the study area. These activities (the Thorncliffe TSF) will be visible from Didingwe Lodge game viewing areas (considered to be sensitive receptor area) and the Helena	Conceivable	Short term (as impact will only occur during the final stages of the TSF)	Beyond the site boundary	Very Low	Low	With good house-keeping the impact is predicted to remain medium

WRD will be partially visible at the homesteads associated with Leshaba Community. Mitigation measures are difficult during the operational phase and due to the nature of the activities the impact will not be significantly reduced during the operational phase						

Table 7: Summary of the visual impact per phase of the project

CLOSURE AND DECOMMISSIONING

Potential Visual Impact	ENVIRONMENTAL SIGNIFICANCE					
	Probability	Duration	Scale	Magnitude/ Severity	Significance	Mitigation effect
Cumulative impact of the final shaping (dust creations) and rehabilitation process that alters the visual quality and sense of place of the study area. These activities and the residual final forms (Thorncliffe TSF) will be visible from the nearby Didingwe Lodge game viewing areas and the Helena WRD will be partially visible at the homesteads associated with Leshaba Community. Apply effective dust suppression techniques. Final grading of the WRD and TSF to avoid harsh excavated lines and to blend with the slopes of the surrounding topography	Conceivable	Short term	Beyond the site boundary	Very Low	Low	With good house-keeping the impact is predicted to remain Very Low

Table 8: Summary of the visual impact of the project

POST CLOSURE PHASE

Potential Visual Impact	ENVIRONMENTAL SIGNIFICANCE					
	Probability	**Duration**	**Scale**	**Magnitude/ Severity**	**Significance**	**Mitigation effect**
Rehabilitation of exposed areas and growth of grasses and other vegetation. Improvement of the visual quality and sense of place from the baseline of the project area visible from nearby tourist area (Didingwe Lodge) game viewing areas and Leshaba. Effective management of rehabilitated areas such that the grassed (hydroseeded) areas are established and permanently sustainable.	Unlikely	Short term	Beyond the site boundary	Very Low	Very Low	With good house-keeping the impact is predicted to remain Low

It is clear when one visits the project sites that prior to the impact of mining activities, the study area would have had a spectacular landscape, given the impressive mountains and rivers associated with the Dwars River system. However, when the landscape types are taken in their totality, and due to the impact of mining activities, the combination of assigned scenic quality ratings suggests an overall rating of *moderate* for the study area within the context of the region. Because of this rating, the study area and particularly the landscape surrounding the Project sites, is rated *moderately* sensitive to change that might occur due to Project activities.

It is anticipated that relatively minor visual resource impacts would result from the operation of the proposed Project. Specifically, impacts would result from the Thorncliffe TSF (in its latter stages) being seen from sensitive viewing areas (Didingwe Lodge game viewing areas) and the Helena WRD being partially visible from Leshaba Community land. These impacts would contribute to the negative cumulative effect of mining activities on the scenic values of the landscape.

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, tourist areas or from public travel routes, especially when the activity would appear in foreground views. Visual impacts that would result during the Operational Phase of the Project, specifically caused by the Thorncliffe TSF and the Helena WRD, will be minor and short term and will not occur in foreground views. The impact on Didingwe tourist areas will occur when the upper levels of the TSF (i.e. late into the project) would become visible to game viewing areas on the Didingwe Lodge property.

At Closure and Decommissioning when the final grading is carried out on the WRD and TSF and topsoil is deposited on the side slopes and then hydroseeded, the impact without mitigation is rated *low* since the TSF would remain visible to some middle-ground views and dust could be generated during the initiation of the rehabilitation period. With effective dust suppression techniques and the successful spreading of topsoil and hydroseeding, the impact would reduce to *very low*.

At Post Closure, the impact will be *very low* and with effective long-term management measures would remain at this rating.

It is of the opinion of the author that the proposed activities fall within an acceptable level of change and should be authorised with the proviso that the management measures be agreed to and that they be rigorously applied and effectively managed.

*** NLA ***

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In order 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 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 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 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. Based on 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 badlands, 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 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	Flowing, or still, but not	Absent, or present, but

	appearing, still, or cascading white water, any of which are a dominant factor in the landscape. **5**	dominant in the landscape. **3**	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 variety while promoting visual harmony. **2**	Modifications add little or no visual variety to the area, and introduce no discordant elements. **0**	Modifications add variety but are very discordant and promote strong disharmony. **4**

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

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

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

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

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

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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. In 2016 he sold his shares in the company but remains as an Associate to the firm.

During his 3 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. In addition to being a founding member of Newtown Landscape Architects he 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.

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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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.

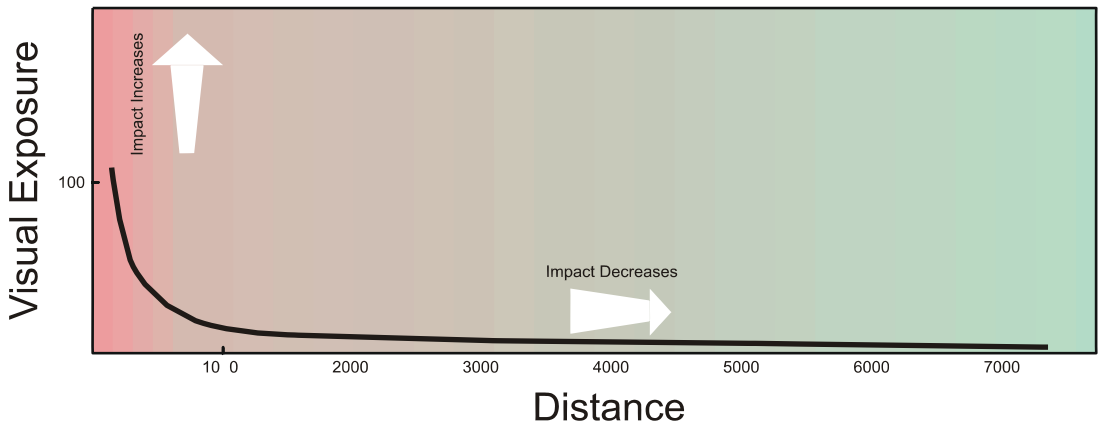
Areas seen from 5.0km to 8.0km and sometimes up to 16km and beyond are considered background. Landforms become the most dominant element at these distances.

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 Figure below.

Effect of Distance on Visual Exposure



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; 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.	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;	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). Roads going through urban and industrial areas

Severity 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)).

Magnitude (Severity) of Visual Impact

High	Moderate	Low	Negligible
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	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 considered to be substantially uncharacteristic when set within the attributes of the receiving landscape. Moderate scenic quality	Minor loss of or alteration to key elements/features/characteristics of the baseline. 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. Low scenic quality	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 are not uncharacteristic with the surrounding landscape – approximating the 'no change' situation. Negligible scenic

impacts would result.	impacts would result	impacts would result.	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 D: METHOD FOR DETERMINING THE *SIGNIFICANCE* OF LANDSCAPE AND VISUAL IMPACT

Note: Part A provides the definition for determining impact consequence (combining Severity, spatial scale and duration) and impact significance (the overall rating of the impact). Impact consequence and significance are determined from Part B and C. The interpretation of the impact significance is given in Part D.

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 definitely 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.
	L	Short-term, occurs for more than 1 but less than 5 years.
	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 portion of the site.
	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

INTENSITY = VL

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**	**Very low**	**Low**	**Low**	**Medium**	**Medium**
	Very short	**VL**	**Very low**	**Low**	**Low**	**Low**	**Medium**

INTENSITY = L

DURATION	Very long	**VH**	**Medium**	**Medium**	**High**	**High**	**High**
	Long term	**H**	**Medium**	**Medium**	**Medium**	**High**	**High**
	Medium term	**M**	**Low**	**Medium**	**Medium**	**Medium**	**High**

	Short term	L	Low	Low	Medium	Medium	Medium
	Very short	VL	Very low	Low	Low	Medium	Medium

INTENSITY = M

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

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

***VH = very high, H = high, M= medium, L= low and VL= very low and + denotes a positive impact.**

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 point (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.

No	Activity	Impact	With/out or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/Severity		Significance		Mitigation Measures	Mitigation Effect
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude		
Planning Phase																
1	No planning activities relevant to visual impacts															
Construction Phase:																
4	Preparation of earthworks and the construction of the **Magareng and Thorncliffe Vent Shafts**	Build access roads to sites, excavation of earth to create terrace for shaft and brocast sites for WRD and TSF; construction activities to build the shaft complex	WOM	Negative	Probable	3	Short term	1	site	2	Low	2	18	Negligible	Remove only vegetation that occurs within the footprint of the activities. Establish a vegetation buffer around the periphery of the vent shaft site. And along the south and east sides of the WRD site	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	site	2	Low	2	10	Negligible		
Operational Phase:																
9	Ongoing construction of the **Thorncliffe TSF and WRD**	Exposure of earth and rock (material with creating landscape character) and the physical presence of the construction activities, construction vehicles and machinery that differs the visual unity and sense of place of the study area. These activities which would also generate dust. However, the activity will be mostly confined to the pit and will not be visible from the adjacent mining and plant activities until the TSF reaches its highest elevations	WOM	Negative	Majorly Probable	4	Long term	4	Regional	3	Low	2	36	Low	Dust-suppression techniques must be implemented across the site. Progressive rehabilitation of the slopes of the WRD and TSF with indigenous grass species	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low		Can be reversed
10	Ongoing construction of the **Helena WRD and PCD**	Physical presence: Exposure of earth and rock (contrast with existing landscape character) and the physical presence of the construction activities, construction vehicles and machinery that differs the visual unity and sense of place of the study area. These activities which would also generate dust. This activity is screened from nearby tourist routes and will not be visible from the general public	WOM	Negative	Probable	3	Short term	1	Site	2	Low	2	10	Negligible	Mitigation will be difficult - Remove vegetation in sections or as excavation proceeds. Ensure that vegetation bunds are maintained along the eastern and southern sides of the site. Implement dust suppression techniques. Construct screen bunds along the eastern and southern sides of the site using indigenous trees and shrubs.	May cause irreplaceable loss of resources
			WM	Negative	Probable	2	Short term	1	site	2	Low	2	10	Negligible		Can be avoided, managed or mitigated
11	Trucks making mined activities to **TSF** and **WRD**	Physical potential: Dust generated by moving trucks that is visible from surrounding areas resulting in a temporary impact on the visual quality and sense of place of the study area. These activities could be visible from nearby tourist areas.	WOM	Negative	Probable	3	Short term	1	site	2	low	3	15	Negligible	The effective application of dust-suppression techniques will reduce the impact	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible		Can be reversed
12	Operation of the **Magareng Vent Shaft**	Physical potential: Presence of the shaft and its ancillary activities at its base. However, the shaft in located near other mining infrastructure and will not be visible from sensitive tourist locations	WOM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible	Good housekeeping around the shaft and ancillary activities will reduce the visual clutter associated with the surrounding environment	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible		Can be avoided, managed or mitigated
13	Lighting of the three sites (including security and any construction activities) associated with the Vent Shaft at night	Light pollution resulting in the alteration (dramatic) intensity of the baseline dark environment and sense of place of the project area. These activities (TDF only) could deviate from nearby tourist activities. It should be noted however that the study area provides a background of night light pollution	WOM	Negative	Majorly Probable	4	Short term	1	Regional	3	Low	2	24	Low	Install light fixtures that provide precisely focused, low-intensity illumination only where it is needed. Avoid high mast lighting. Where security lighting is installed at the periphery of the site it should be motion activated and switched on only when nearby workers are present	Can be avoided, managed or mitigated
			WM	Negative	Probable	4	Long term	4	Site	2	Low	2	18	Negligible		Can be reversed
Closure and Decommissioning Phase																
14	Final shaping and rehabilitation of **WRD** and **TDF**	Improvement of the visual quality and sense of place of the Operational Phase of the project.	WOM	Negative	probable	3	Long term	4	Regional	3	Low	2	18	Negligible	Apply effective dust-suppression techniques and adequately compact all rehabilitated WRD and TDF slopes. Establish a vegetation buffer around the periphery of the WRD site to be maintained and managed.	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Regional	3	Low	2	18	Negligible		Can be reversed
15	Closure of the **Magareng and Thorncliffe Vent Shafts**	Physical presence of the activities associated with removing the structures and rehabilitating the site. However, these activities will most likely not be visible from sensitive tourist areas and the overall environment will improve from the operational phase.	WOM	Negative	Probable	2	Long term	4	Site	2	Low	2	18	Negligible	Ensure dust suppression techniques are effectively applied and that the site is rehabilitated with indigenous grasses, shrubs and trees	Can be reversed
			WM	Negative	Probable	2	Long term	4	Site	2	low	2	18	Negligible		Can be reversed
Post-Closure Phase																
16	Rehabilitation of disused areas and growth of grasses and vegetation for all three sites	Improvement of the visual quality and sense of place from the operational phase of the project but adding to the cumulative effect of mining activities in the area against the baseline.	WOM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	Effective management of rehabilitated areas to ensure successful establishment of the TDF and the three boreds	Can be reversed
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible		Can be reversed