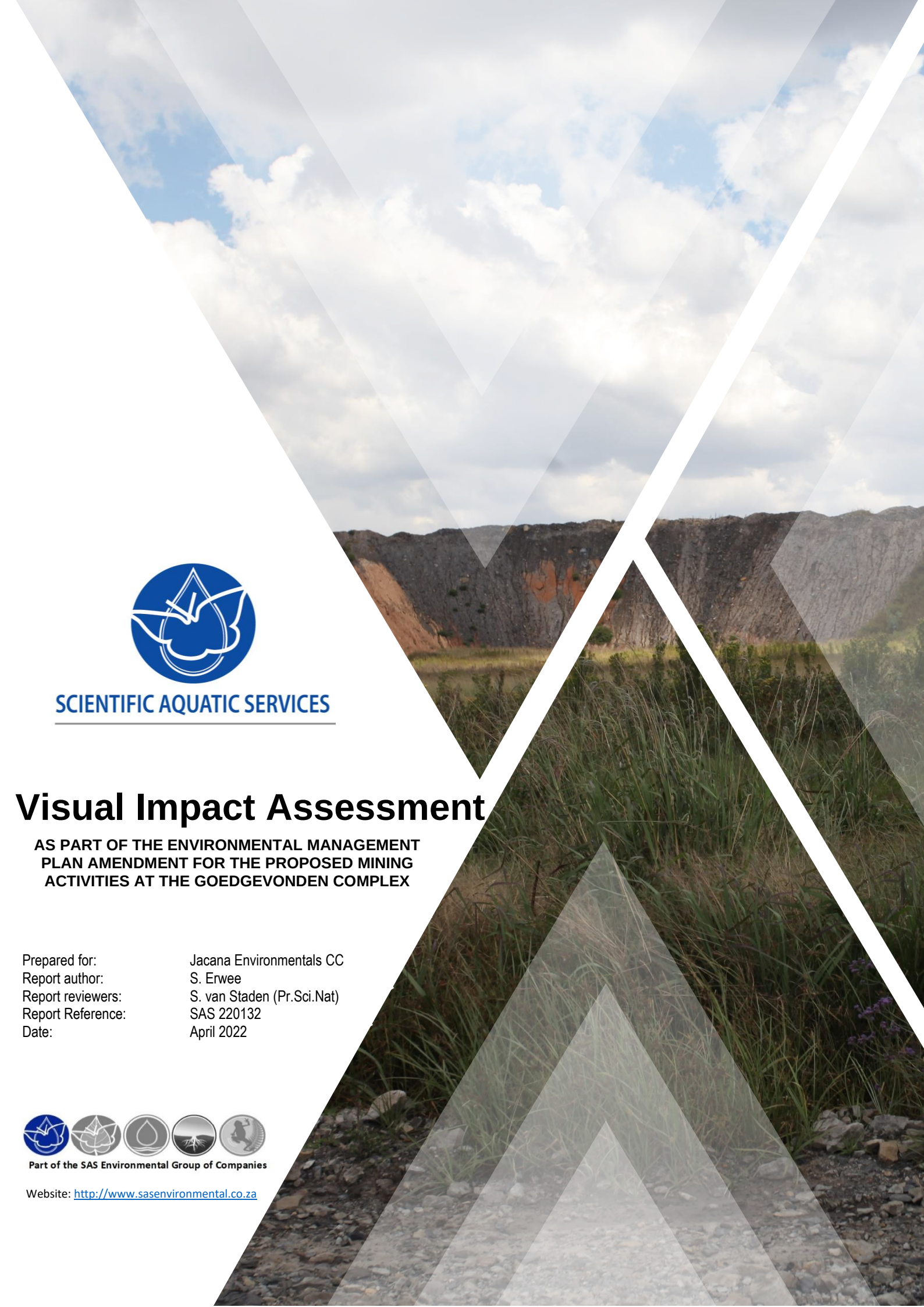

SCIENTIFIC AQUATIC SERVICES

Visual Impact Assessment

AS PART OF THE ENVIRONMENTAL MANAGEMENT PLAN AMENDMENT FOR THE PROPOSED MINING ACTIVITIES AT THE GOEDGEVONDEN COMPLEX

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Report Reference:	SAS 220132
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EXECUTIVE SUMMARY

Scientific Aquatic Services (SAS) was appointed to conduct a Visual Impact Assessment (VIA) as part of the Environmental Authorisation (EA) process for the proposed Goedgevonden (GGV) Environmental Management Plan (EMP) amendment, located near Ogies, Mpumalanga Province. The proposed new amendment consists of mining activities across the mining rights area (MRA) - encompassing the two mining operations: GGV Colliery and the Oogiesfontein (OFT) Colliery.

The MRA is located within the Emalaheni Local Municipality which is an administrative area of the Nkangala District Municipality. The MRA is located approximately 4 km south of the N12 National Route, and approximately 29 km southwest of Witbank. The GGV authorised layout consists of the following:

- Access roads;
- Internal roads;
- Rail loop;
- River diversions;
- Coal processing plant complex;
- Mine residue facility;
- Open cast mining areas;
- Pollution control dam (PCD);
- Run of Mine (RoM) trip;
- Road diversion; and
- Underground mining areas.

The proposed new amendment consists of mining activities across the MRA which encompasses the two mining operations: GGV Colliery and OFT Colliery. The amendment consists of the following:

- GGV Central underground Block;
- GGV East underground Block
- GGV Northern underground Block
- GGV Southern underground Block
- Four Inclines (namely inclines 1 to 4);
- A new road alignment;
- OFT Eastern Underground Block; and
- OFT Southern Underground Block.

Since the proposed mining activities will be underground mining these areas were not assessed during the field assessment, as there will be no infrastructure above ground. As such, the field assessment focused on the four incline shaft areas. Although the baseline study was undertaken considering the prevailing conditions (Grassland, farmland and freshwater ecosystems) at the time of the assessment in December 2020 and April 2022, it is acknowledged that authorization has previously been granted for opencast mining within the assessed areas. At the time of preparing this report, the mine plan entails undertaking opencast mining prior to the proposed underground mining, and as a result the proposed incline shafts will be developed into the high walls of the opencast areas. The data and discussions presented within this report are however based on the current state of the environment, i.e., pre-opencast mining. The risk assessment was however undertaken based on the chronological order of the proposed mine plan, i.e. that the opencast mining will occur prior to the development of the inclines. Should the mine plan change, the risk assessment will need to be revised accordingly to adequately consider the impact of the proposed development.

Based on the outcome of the field assessment it is evident that the proposed incline shafts 1, 3 and 4 are located within the GGV active mining area which are surrounded by dumps, or located within the open pit area (incline shaft 1) thus obscured partially and completely from the surrounding sensitive receptors. Since the proposed incline shafts are located within areas where active mining is taking place, the proposed incline shafts will not be significantly visually intrusive on the receiving environment. When considering the broader landscape, mining is a dominant land-use and the mining infrastructure (dumps and Tailings Storage Facilities(TSFs)) form prominent features in the landscape, hence the proposed incline shafts will blend in with the already existing mining infrastructure. As such the proposed incline shafts will blend into the background and will be relatively indistinguishable from the other mining infrastructure.

The incline shaft areas are characterised by the following land uses; mining and agricultural activities and natural and modified wetlands, and secondary grassland. The closest town to GGV is Ogies which is located approximately 1 km north north west of incline shaft 1. Permanent residents in the area, people at their place of work and motorists traveling along roads are all considered sensitive receptors, and the degree to which they are sensitive to the surrounding landscape does however vary. Due to the existing mining activities present in the area, the residents, workers and motorists traveling in the area have grown accustomed to the mining setting and mining silhouette therefore the sensitivity of these receptors may be considered moderate to low.

The local topography of the proposed incline shaft areas 1 and 3 have been severely altered by active mining activities, as incline shaft 1 is situated in an opencast pit and incline shaft 3 is situated at a dump. Incline shaft areas 2 and 4 consists of flat to slightly undulating plains, and is surrounded by mining infrastructure which form part of the skyline. Even though the topography of the area has been altered by the mining operations, the dumps forming part of the skyline will result in the incline shafts not being visually significantly intrusive nor significantly visible.

The habitat within the proposed incline shaft areas are predominantly transformed and modified habitat with few portions classified as natural habitat. The incline shaft areas 1 and 3 does not have much vegetation left since it is mostly transformed by active mining areas, while incline shaft areas 2 and 4 are mostly dominated by graminoid species. Since the proposed incline shaft areas are either associated with active mining activities (hence limited to no vegetation) or grasslands, the vegetative component of the area provides limited screening ability.

The proposed project is located within an area that is dominated by mining operations interspersed with isolated farmsteads and the town of Ogies. The existing mining activities, have altered the character of the landscape from a rural setting to a mining setting. As such, the visual impact associated with mining activities are already present in the area, and receptors within the vicinity thereof have grown accustomed to it. As such it can be considered that the proposed incline shaft areas and additional proposed mining operations will not have a negative effect on the landscape character of the area.

The Visual Absorption Capacity (VAC) of the area is considered medium, indicating that the proposed project will be moderately absorbed in the area resulting in a relatively low visual intrusion, thus the proposed project will blend in with the surroundings. The existing mining operations are the main contributing factor to the medium VAC and with the relatively low height of the proposed infrastructure in comparison to the already existing mining structures, the proposed incline shaft areas are insignificant.

The sense of place associated with the proposed incline shaft areas are related to the landscape character type, defined as a mining setting interspersed with farmsteads and cultivated fields with gently undulating terrain. With the proposed incline shaft areas situated within an active mining area the sense of place of the area can further be described as busy with mining operations taking place 24 hours a day 7 days a week. The sense of place extends to a large portion of the Mpumalanga Province especially within the surrounding towns – Coalville, Kendal, Kriel, Delmas etc. As the landscape is already accustomed to mining activities, the proposed project will not have a significant effect on the sense of place of the larger area.

The existing mining activities act as an extensive source of high-level night-time lighting. Medium level light sources impacting on the area also originate from the town of Ogies located 1 km north north west and the farmsteads in the surrounding area. The lighting environment of the region is therefore considered Suburban with medium district brightness. As a result of the existing night-time light sources, lighting levels are not expected to significantly increase in this area due to the proposed infrastructure.

Should the existing approved mine plan for opencast mining be followed, namely, to develop the proposed incline shafts into the high wall of the opencast pits, the development of the proposed incline shafts and underground mining areas will have an almost negligible additional visual impact on the receiving environment although some additional night-time lighting impacts will occur. On this basis, the outcome of the risk assessment indicated that the risk is deemed to be of ‘low’ significance, since the elevation of the proposed incline shafts are reduced and the area is already significantly disturbed from the opencast mining activities, thus the visual intrusion and visual exposure of the proposed incline shafts are negligible. As there are existing mining activities within the immediate vicinity, the receptors

within the area are accustomed to the mining infrastructure, therefore the proposed project will not have a significant visual impact on the surrounding receptors. It is the opinion of the specialist that the project be considered acceptable from a visual resource management perspective, provided that the mitigatory measures as outlined in the report are implemented and adhered to as far as practically possible.

DOCUMENT GUIDE

The following table indicates the requirements for Specialist Studies as per Appendix 6 of Government Notice 326 as published in Government Notice 40772 of 2017, amendments to the Environmental Impact Assessment (EIA) Regulations, 2014 as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998).

NEMA Regulations (2014) - Appendix 6		**Relevant section in report**
1a	Details of	
	(i) the specialist who prepared the report; and	Appendix L
	(ii) the expertise of that specialist to compile a specialist report including	Appendix L
b	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix L
c	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.2
cA	an indication of the quality and age of base data used for the specialist report	Section 3
cB	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 6
d	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 4.2
e	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 4 and Appendix A to J
f	details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan	Section 5
g	an identification of any areas to be avoided, including buffers	Not applicable – findings from ecological assessment may be used to conserve natural visual resources
h	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Not applicable – findings from ecological assessment may be used to conserve natural visual resources
i	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.5
j	a description of the findings and potential implications of such findings on the impact of the proposed activity including identified alternatives on the environment or activities;	Section 5 and 6
k	any mitigation measures for inclusion in the EMPr	Section 5
l	any conditions for inclusion in the environmental authorisation	Section 5
m	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 5
n	a reasoned opinion	
	(i)as to whether the proposed activity, activities or portions thereof should be authorised;	Section 6
	(1A) regarding the acceptability of the proposed activity or activities; and	Section 6
	(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 5
o	a description of any consultation process that was undertaken during the course of preparing the specialist report;	Consultation with interested and affected parties (I&APs) will be undertaken as part of the project
p	summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Comments and responses that are raised by I&APs will be included in the EIA / EMP report compiled by the EAP
q	any other information requested by the competent authority	No information requested at this time

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GLOSSARY OF TERMS

Best Practicable Environmental Option	This is the alternative/option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.
Characterisation	The process of identifying areas of similar landscape character, classifying and mapping them and describing their character.
Characteristics	An element, or combinations of elements, which make a contribution to landscape character.
Development	Any proposal that results in a change to the landscape and/ or visual environment.
Elements	Individual parts, which make up the landscape, for example trees and buildings.
Feature	Particularly prominent or eye-catching elements in the landscape such as tree clumps, church towers or wooded skylines.
Geographic Information System (GIS)	A system that captures, stores, analyses, manages and presents data linked to location. It links spatial information to a digital database.
Impact (Visual)	A description of the effect of an aspect of the development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.
Key characteristics	Those combinations of elements which are particularly important to the current character of the landscape and help to give an area it particularly distinctive sense of place.
Land cover	The surface cover of the land, usually expressed in terms of vegetation cover or the lack of it. Related to but not the same as Land use.
Land use	What land is used for based on broad categories of functional land cover, such as urban and industrial use and the different types of agriculture and forestry.
Landform	The shape and form of the land surface which has resulted from combinations of geology, geomorphology, slope, elevation and physical processes.
Landscape	An area, as perceived by people, the character of which is the result of the action and interaction, of natural and/ or human factors.
Landscape Character Type	These are distinct types of landscape that are relatively homogeneous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they occur, they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern, and perceptual and aesthetic attributes.
Landscape integrity	The relative intactness of the existing landscape or townscape, whether natural, rural or urban, and with an absence of intrusions or discordant structures.
Landscape quality	A measure of the physical state of the landscape. It may include the extent to which typical landscape character is represented in individual areas, the intactness of the landscape and the condition of individual elements.
Landscape value	The relative value that is attached to different landscapes by society. A landscape may be valued by different stakeholders for a variety of reasons.
Receptors	Individuals, groups or communities who are subject to the visual influence of a particular project. Also referred to as viewers, or viewer groups.
Sense of place	The unique quality or character of a place, whether natural, rural or urban, allocated to a place or area through cognitive experience by the user. It relates to uniqueness, distinctiveness or strong identity and is sometimes referred to as genius loci meaning 'spirit of the place'.
Sky glow	Brightening of the night sky caused by outdoor lighting and natural atmospheric and celestial factors.
Skylining	Siting of a structure on or near a ridgeline so that it is silhouetted against the sky.

View catchment area	A geographic area, usually defined by the topography, within which a particular project or other feature would generally be visible.
Viewshed	The outer boundary defining a view catchment area, usually along crests and ridgelines.
Visibility	The area from which project components would potentially be visible. Visibility is a function of line of sight and forms the basis of the VIA as only visible structures will influence the visual character of the area. Visibility is determined by conducting a viewshed analysis which calculates the geographical locations from where the proposed power line might be visible.
Visual Absorption Capacity	The ability of an area to visually absorb development as a result of screening topography, vegetation or structures in the landscape.
Visual Character	The overall impression of a landscape created by the order of the patterns composing it; the visual elements of these patterns are the form, line, colour and texture of the landscape's components. Their interrelationships are described in terms of dominance, scale, diversity and continuity. This characteristic is also associated with land use.
Visual Exposure	The relative visibility of a project or feature in the landscape. Visual exposure is based on distance from the project to selected viewpoints. Visual exposure or visual impact tends to diminish exponentially with distance.
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.
Zone of visual influence	An area subject to the direct visual influence of a particular project.

*Definitions were derived from Oberholzer (2005) and the Institute of Environmental Management and Assessment (2013)

LIST OF ACRONYMS

ARC	Agricultural Research Council
BLM	(United States) Bureau of Land Management
BPEO	Best Practicable Environmental Option
DEM	Digital Elevation Model
DMRE	Department of Mineral Resources and Energy
DTM	Digital Terrain Model
DWAF	Department of Water Affairs and Forestry
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
GGV	Goedgevonden
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning Systems
IAPs	Interested and Affected Parties
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
KOP	Key Observation Point
LI IEMA	Landscape Institute and Institute of Environmental Management and Assessment
m.a.m.s.l.	Meters above mean sea level
MRA	Mining Rights Area
NEMA	National Environmental Management Act (No. 108 of 1997)
NGL	Natural Ground Level
NOMR	New Order Mining Right
OFT	Oogiesfontein
PCD	Pollution Control Dam
PNR	Private Nature Reserve
ROM	Run of Mine
SACAD	South African Conservation Areas Database
SANBI	South African National Biodiversity Institute
SAPAD	South African Protected Areas Database
SAS	Scientific Aquatic Services
UNESCO	United Nations Educational Scientific and Cultural Organization
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
VRM	Visual Resource Management
WHS	World Heritage Site

1 INTRODUCTION

1.1 Background

Scientific Aquatic Services (SAS) was appointed to conduct a Visual Impact Assessment (VIA) as part of the Environmental Authorisation (EA) process for the proposed Goedgevonden (GGV) Environmental Management Plan (EMP) amendment, located near Ogies, Mpumalanga Province. The proposed new amendment consists of mining activities across the mining rights area (MRA) - encompassing the two mining operations: GGV Colliery and the Oogiesfontein (OFT) Colliery.

The MRA is located within the Emalaheni Local Municipality which is an administrative area of the Nkangala District Municipality. The MRA is located approximately 4 km south of the N12 National Route, and approximately 29 km southwest of Witbank. The location and extent of the MRA is indicated in Figures 1 and 2. The proposed layouts illustrating previously authorised infrastructure and mining activities as well as the proposed new amendment layout is provided in Figures 3 – 5. Refer to Section 1.2 for a detailed project description.

A VIA entails a process of data collection, spatial analysis, visualisation and interpretation to describe the quality of the landscape prior to development taking place and then identifying possible visual impacts after development. Assessing visual impacts are difficult as it is very subjective due to a person's perception being affected by more than only the immediate environmental factors (Oberholzer, 2005).

This report, after consideration and description of the visual integrity of the MRA, must guide the proponent, authorities and Environmental Assessment Practitioner (EAP), by means of recommendations, as to the suitability of the MRA for the intended land use, from a visual resource management and aesthetic point of view. This report should furthermore serve to inform the planning, design and decision-making process as to the layout and nature of the proposed development activities.

1.2 Project Description

The proposed layouts illustrating previously authorised infrastructure and mining activities as well as the proposed new amendment layout is provided in Figures 3 – 5.

The GGV authorised layout consists of the following:

- Access roads;
- Internal roads;
- Rail loop;

- River diversions;
- Coal processing plant complex;
- Mine residue facility;
- Open cast mining areas;
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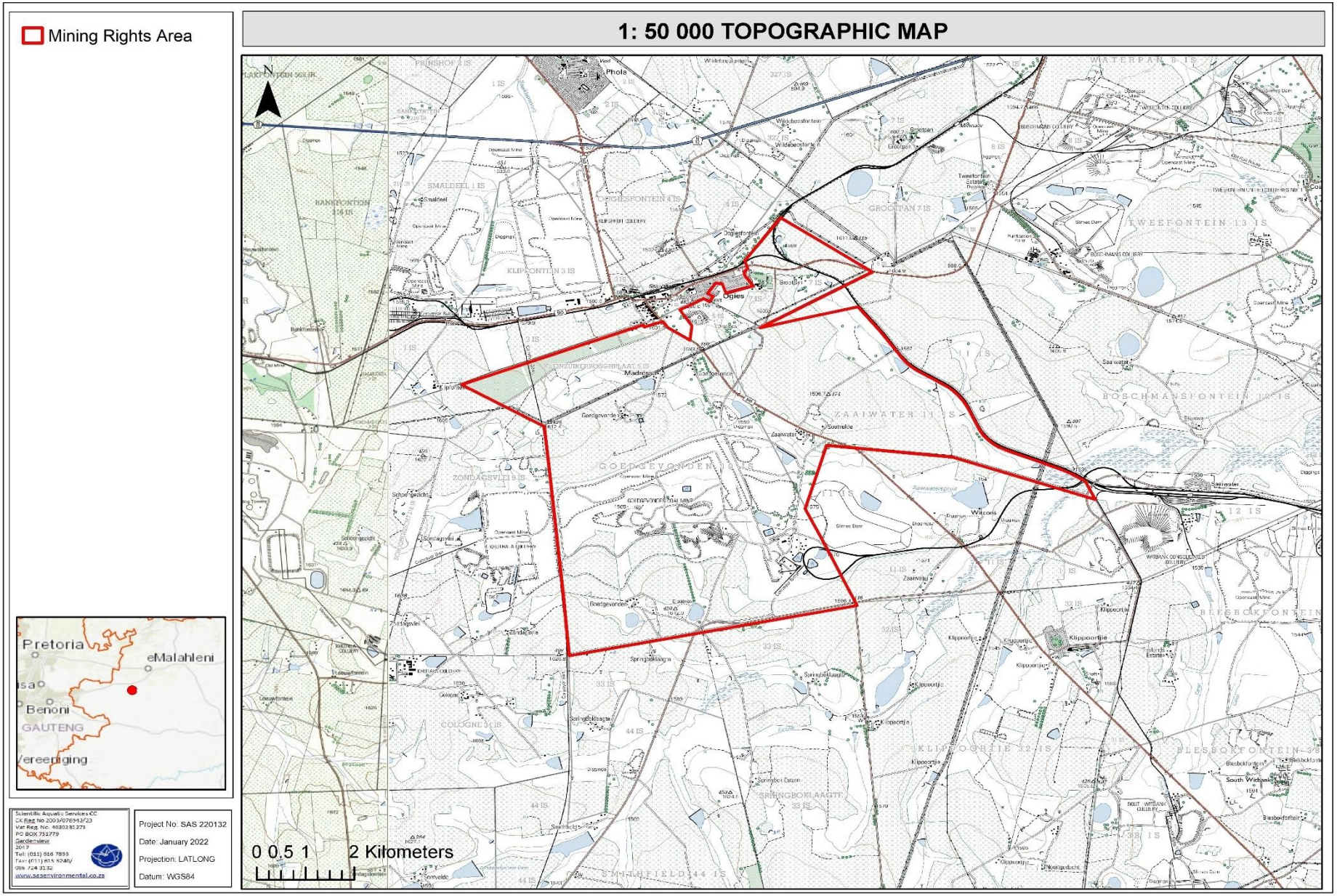


Figure 1: 1:50 000 Topographical map depicting the location of the MRA in relation to the surrounding region.

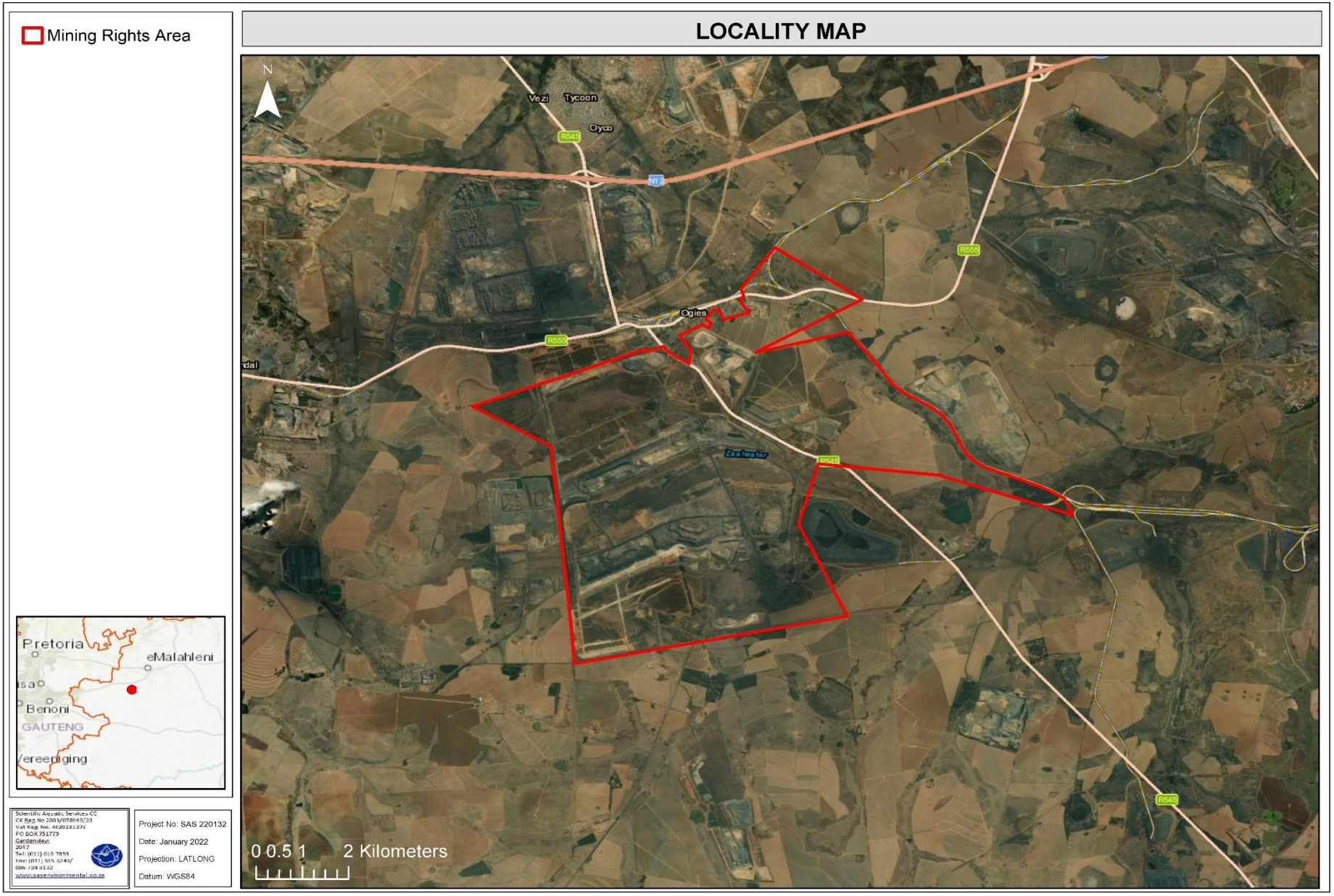


Figure 2: Digital satellite image depicting the location of the MRA in relation to the surrounding region.

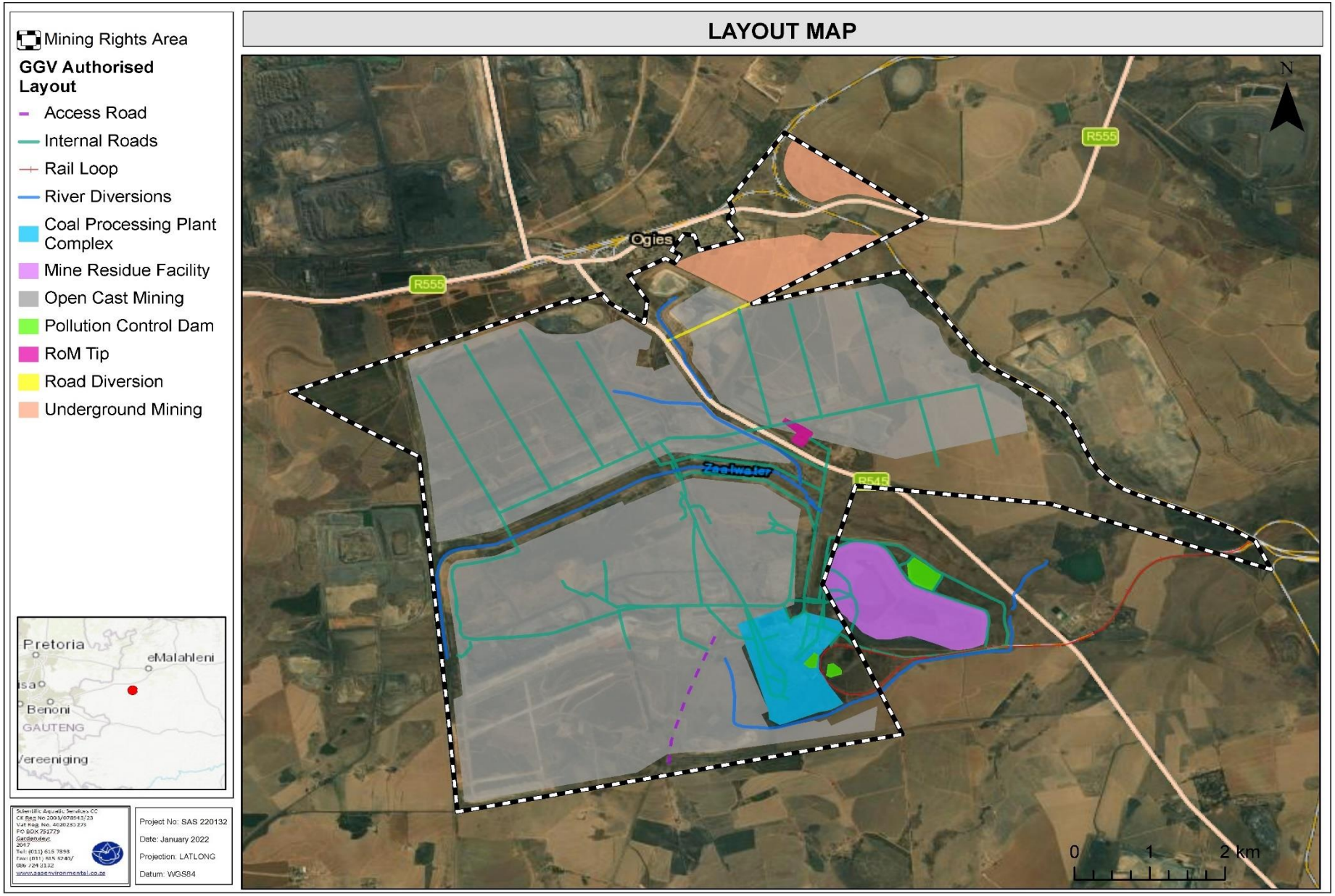


Figure 3: The GGV authorised layout within the MRA in relation to the surrounding area.

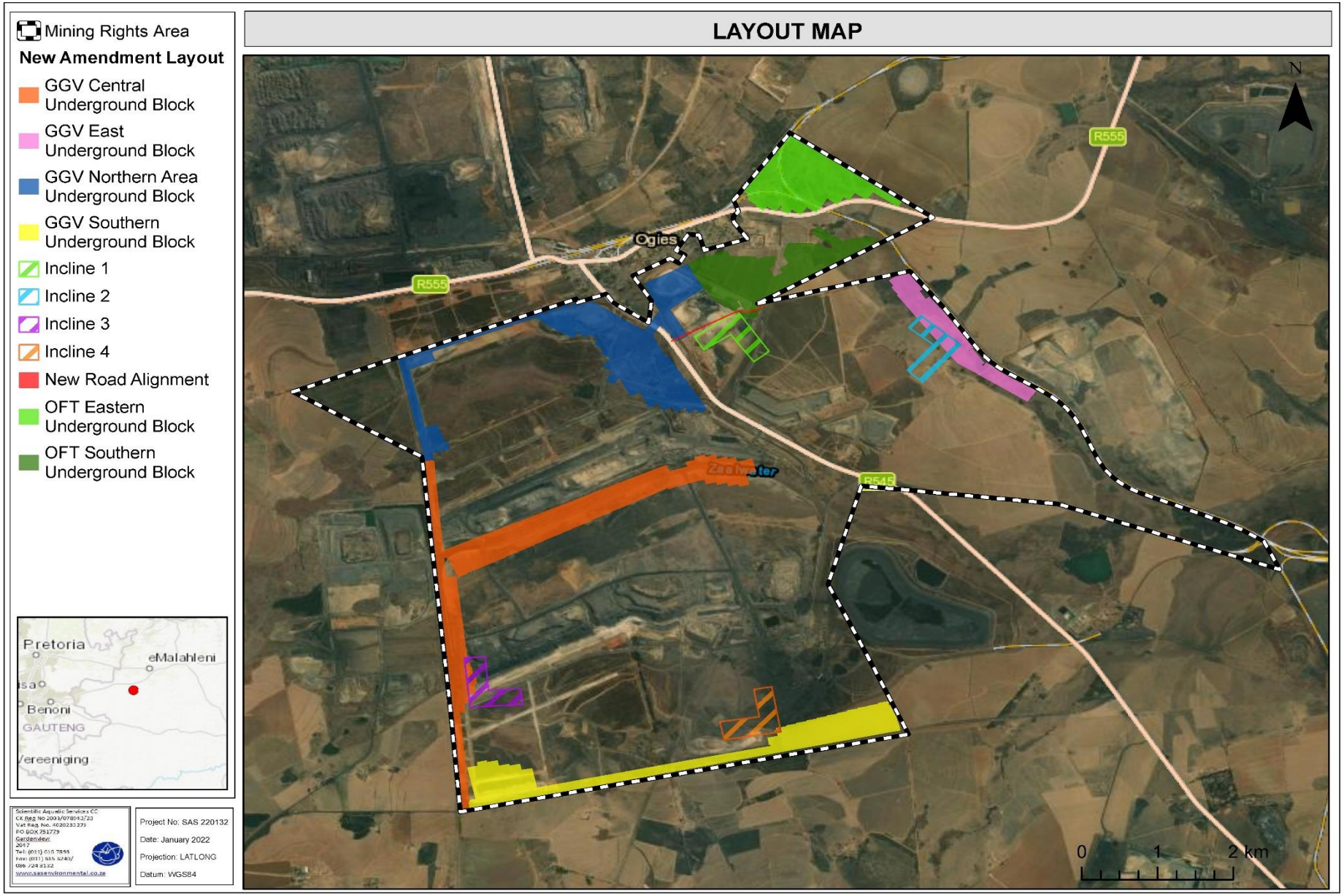


Figure 4: The new amendment layout proposed for the MRA in relation to the surrounding area.

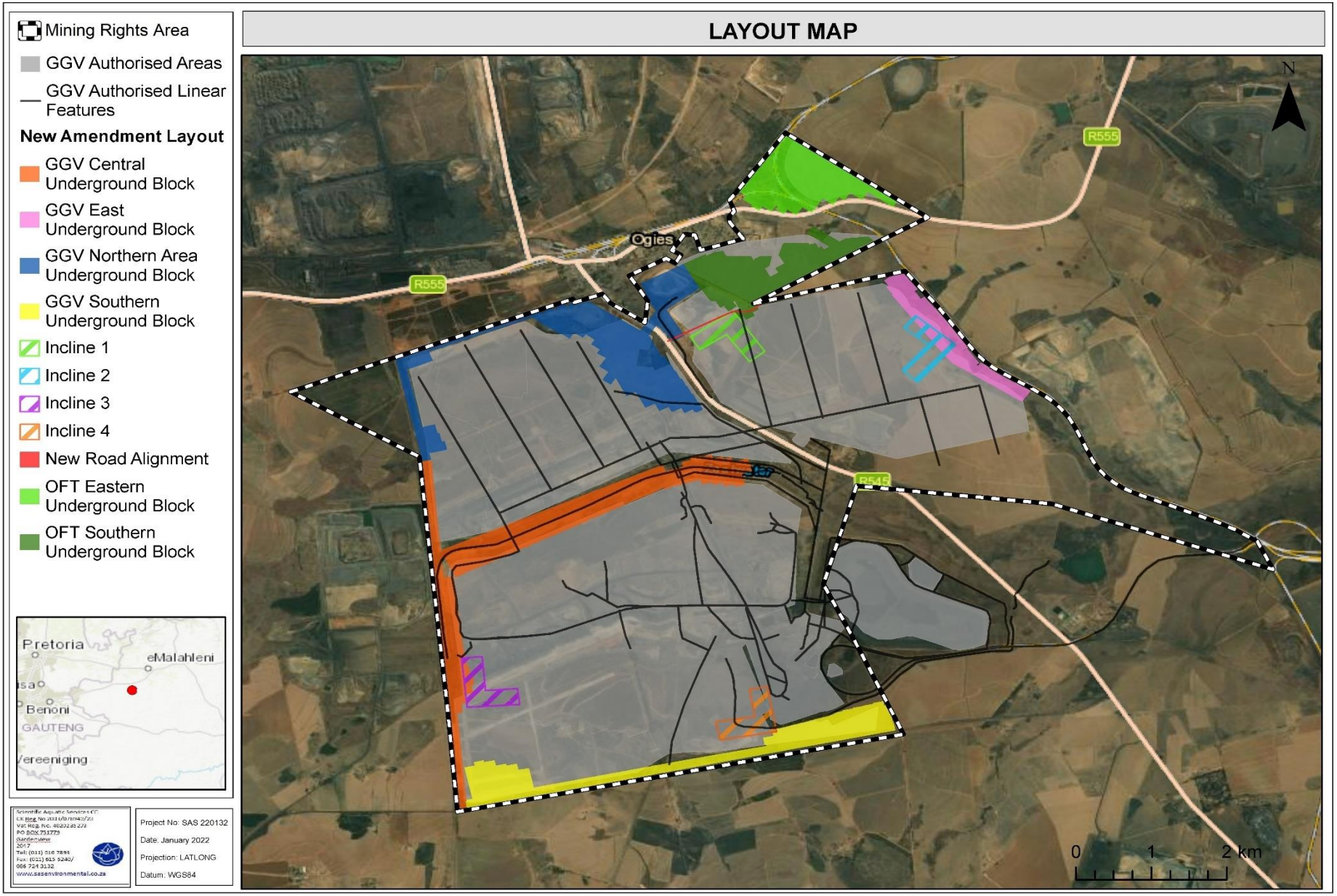


Figure 5: New amendment layout superimposed onto the GGV authorised layout within the MRA.

1.3 Project Scope

The purpose of this report is:

- To determine the Category of Development and Level of Assessment as outlined by Oberholzer (2005);
- To describe the receiving environment in terms of regional context, location and environmental and landscape characteristics;
- To describe and characterise the proposed project and the receiving environment in its envisioned future state;
- To identify the main viewsheds through undertaking a viewshed analysis, based on the proposed heights of infrastructure components and the Digital Elevation Model (DEM), as a mechanism to identify the locations of potential sensitive receptors sites and the distance of these receptor sites from the MRA;
- To identify and describe potential sensitive visual receptors residing at or utilising receptor sites;
- To establish receptor sites and identify Key Observation Points (KOPs) from which the proposed project will have a potential visual impact, if necessary;
- To prepare a photographic study and conceptual visual simulation of the proposed project as the basis for the viewshed identification and analysis, if necessary;
- To assess the potential visual impact of the proposed project from selected receptors sites in terms of standard procedures and guidelines; and
- To describe mitigation measures in order to minimise any potential visual impacts.

1.4 Principles and Concepts of VIAs

Visual resources have value in terms of the regional economy and inhabitants of the region. Furthermore, these resources are often difficult to place a value on as they normally also have cultural or symbolic values. Therefore, VIAs are to be performed in a logical, holistic, transparent and consistent manner. Oberholzer (2005) identifies the following concepts to form an integral part of the VIA process:

- Visual resources include the visual, aesthetic, cultural and spiritual aspects of the environment, which contribute toward and define an area's sense of place;
- Natural and cultural landscapes are inter-connected and must be considered as such;
- All scenic resources, protected areas and sites of special interest within a region need to be identified and considered as part of the VIA;
- All landscape processes such as geology, topography, vegetation and settlement patterns that characterise the landscape must be considered;

- Both quantitative criteria, such as 'visibility' and qualitative criteria, such as aesthetic value or sense of place has to be included as part of the assessment;
- VIAs must inform the EIA process in terms of visual inputs; and
- Public involvement must form part of the process.

The guideline furthermore recommends that the VIA process identifies the Best Practicable Environmental Option (BPEO) based on the following criteria:

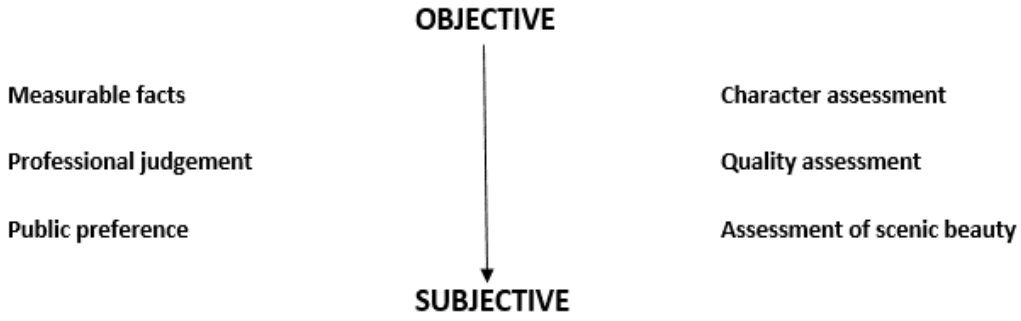
- Long term protection of important scenic resources and heritage sites;
- Minimisation of visual intrusion on scenic resources;
- Retention of wilderness or special areas intact as far as possible; and
- Responsiveness to the area's uniqueness, or sense of place.

1.5 Assumptions and Limitations

- Detailed assessments were confined to the proposed amendment layout areas, specifically the proposed incline shaft areas, and not the entire MRA;
- No specific national legal requirements for VIAs currently exist in South Africa. However, the assessment of visual impacts is required by implication when the provisions of relevant acts governing environmental management are considered and when certain characteristics of either the receiving environment or the proposed project indicate that visibility and aesthetics are likely to be significant issues and that visual input is required (Oberholzer, 2005);
- Due to a lack of visual specialist guidelines within the Mpumalanga Province, the "Guidelines for Involving Visual and Aesthetic Specialists in the EIA Process" (Oberholzer, 2005), prepared for the Western Cape Department of Environmental Affairs & Development Planning, was used;
- Distance and terrain plays a critical role when assessing visual impacts of an area. All potential sensitive receptors located within a 5 km radius, were identified on a desktop-level, some of which would then be verified during the field assessment. Since the proposed incline shafts are located within the active mining area it was deemed necessary to only investigate sensitive receptors located within a 2 km radius during the field assessment. The 2 km radius can be considered the "visual assessment zone". It should be noted that the visibility of an object decreases exponentially the further away the observer is from the source of impact;
- All information relating to the proposed project as referred to in this report is assumed to be the latest available information. Additionally, best practice guidelines were taken into consideration and the maximum expected heights of the infrastructure and the

placement thereof utilised in the viewshed calculations as a precautionary approach; and

- It is acknowledged that the future mine plan involves an approved opencast mining approach. This future opencast mining will include the areas in which the proposed incline shaft areas are located. As such, in the event that the future opencast mining is carried out, the quantum of risk posed to the visual aspect of the environment within which the currently proposed incline shaft areas are situated will be minimal, as visual scarring from the proposed opencast pit will already be present and the proposed incline shafts will be developed into the high walls of the pits reducing the elevation of the structures and thus the visual impact; and
- The data and discussions presented within this report are based on the current state of the environment, i.e., pre-opencast mining;
- Abstract or qualitative aspects of the environment and the intangible value of elements of visual and aesthetic significance are difficult to measure or quantify and as such depend to some degree on subjective judgments. It therefore is necessary to differentiate between aspects that involve a degree of subjective opinion and those that are more objective and quantifiable, as outlined in the diagram below (The Landscape Institute and Institute of Environmental Management and Assessment (LI IEMA, 2002).



2 LEGAL, POLICY AND PLANNING CONTEXT FOR VIAs

Oberholzer (2005) indicates that current South African environmental legislation governing the EIA process, which may include consideration of visual impacts if this is identified as a key issue of concern, is the National Environmental Management Act (NEMA) (Act 107 of 1998). This includes the 2014 NEMA EIA regulations as amended (published in General Notice (GN) No. R.982 as well as R 983 Listing Notice 1, R 984 Listing Notice 2 and R 985 Listing Notice 3).

In addition, the following acts and guidelines are applicable (Oberholzer, 2005):

National Environmental Management: Protected Areas Act (Act No. 57 of 2003)

This act is intended to identify and protect natural landscapes.

Since there are no protected areas located within a 10 km radius of the (refer to Section 4.3), this Act does not apply to this project.

National Heritage Resources Act (Act No. 25 of 1999)

This provides legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes.

Advertising on Roads and Ribbons Act (Act No. 21 of 1940)

Visual pollution is controlled, to a limited extent, by the Advertising on Roads and Ribbons Act (Act 21 of 1940), which deals mainly with signage on public roads.

Municipal Systems Act (Act 32 of 2000)

In terms of the Municipal Systems Act (Act 32 of 2000), it is compulsory for all municipalities to initiate an Integrated Development Planning (IDP) process in order to prepare a five-year strategic development plan for the area under their control. The IDP process, specifically the spatial component is based in certain areas and provinces on a bioregional planning approach to achieve continuity in the landscape and to maintain important natural areas and ecological processes. The proposed incline shaft areas are situated within the Emalahleni Local Municipality and the Nkangala District Municipality, of which both IDPs for 2017-2022 are available.

According to the Emalahleni Local Municipality Final IDP (2021) the landscape is dominated by underground and opencast coal mines. Its mining and industrial history is reflected in the area's heritage sites. The municipal economy is dominated by mining and therefore there is a high dependence on the mining industry for economic growth of the local municipality. This area is thus characterised by conflicting demand between mining, electricity generation and agriculture. The primary objective should be to prevent mining activities from encroaching onto high potential agricultural land and areas of high biodiversity; and to ensure that rehabilitation is fully implemented and the agricultural value be restored post closure and decommissioning.

Other

- Visual and aesthetic resources are also protected by local authorities, where policies and by-laws relating to urban edge lines, scenic drives, special areas, signage, communication masts, etc. have been formulated; and
- Other decision-making authorities such as the Department of Mineral Resources and Energy (DMRE), or the local authorities, in terms of their particular legislative frameworks, may also require VIAs to support informed decision-making.

3 METHOD OF ASSESSMENT

3.1 Desktop Assessment

The method of assessment for this report is based on a spatial analysis of the MRA and the surrounding areas, using Geographic Information Systems (GIS) such as Planet GIS, ArcGIS, Global Mapper as well as digital satellite imagery, photographs, various databases and all available data on the planned infrastructure. The desktop assessment served to guide the field assessment through identifying preliminary areas of importance in terms of potential visual impacts.

The desktop study included an assessment of the current state of the environment of the area including the climate of the area, topography, land uses and land cover with data obtained from the websites of the South African National Biodiversity Institute (SANBI) and the Agricultural Research Council (ARC). All databases used were published within the last 5 years and contain up to date and relevant information.

During the desktop assessment, which took place prior to and in preparation of the field assessment, the 1:50 000 topographical map, as well as high definition aerial photographs from Google Earth Pro were used to identify the dominant landforms and landscape patterns. These resources together with digital elevation data were utilised to establish a parameter within which potential sensitive receptors were to be identified via Google Earth Pro. These parameters can henceforth be referred to as the “visual assessment zone”. Based on the active mining activities in the area, the visual assessment zone encompasses a 2 km radius of the MRA. The potentially sensitive receptors identified within the visual assessment zone during the desktop assessment was verified during the field assessment.

Detailed assessment methods used to determine the landscape characteristics of the receiving environment and potential visual impacts of the project are outlined in the relevant sections below as well as in Appendices A – J.

3.2 Field Assessment

The initial field assessment was undertaken during the summer season on the 11th of November 2020 for the proposed infrastructure of GGV amendment. A second site visit was undertaken on the 6th of April 2022. The season within which the VIA takes place is irrelevant

as the vegetation screening factor will remain similar. Seasonal colour variation will however be evident between winter and summer.

The field assessment included a drive-around and on-foot survey of the new amendment areas and in the immediate vicinity thereof and a drive-around of the surrounds, in order to determine the visual context within which the proposed project is to be developed. Focus was placed on assessing the potentially sensitive receptors identified within the visual assessment zone, these included settlements, farmsteads and prominent roads within the area. Points from where the proposed infrastructure was determined to be visible were recorded (making use of Global Positioning Systems (GPS) to confirm these aesthetically sensitive viewpoints and potential sensitive visual receptors in relation to the proposed project.

4 RESULTS OF INVESTIGATION

4.1 Public Involvement

A public involvement process will be initiated as part of the Environmental Impact Assessment (EIA) and authorisation process, at which time stakeholders are invited to provide input concerning the proposed development. Any concerns regarding visual impacts will be addressed through this process. Please refer to Section 1.2 for a detailed description of the proposed project.

4.2 Development Category and Level of Impact Assessment

Through application of the VIA methods of assessment as presented in Appendix A, it was determined that the proposed project can be defined as a Category 5 development, which includes mining activities. According to Oberholzer (2005), a high visual impact is therefore expected, with potentially high visual intrusion on farmsteads and the town of Ogies within the area and may potentially lead to a significant change in the scenic resources and visual character of the area. In line with the above, a Level 4 Assessment should be undertaken.

Based on the outcome of the field assessment it is evident that the proposed incline shafts 1, 3 and 4 are located within the GGV active mining area which are surrounded by dumps, or located within the open pit area (incline shaft 1) thus obscured partially and completely from the surrounding sensitive receptors. Since the proposed incline shafts are located within areas where active mining is taking place, the proposed incline shafts will not be significantly visually intrusive on the receiving environment. When considering the broader landscape, mining is a

dominant land-use and the mining infrastructure (dumps and TSFs) form prominent features in the landscape, hence the proposed incline shafts will blend in with the already existing mining infrastructure. As such the proposed incline shafts will blend into the background and will be indistinguishable from the other mining infrastructure. In light of the above, the proposed project is likely to have a moderately low visual impact on the receiving environment, therefore a Level 2 Assessment was undertaken versus a level 4 Assessment.

4.3 Description of the Receiving Environment

To holistically describe the receiving environment, this section of the report aims to determine the intrinsic value of the receiving landscape including aspects of the natural, cultural and scenic landscape, taking both tangible and intangible factors into consideration. The table below aims to describe the particular character, uniqueness, intactness, rarity, vulnerability and representability of the MRA within its existing context. General views of the landscape associated with the MRA and surrounds with respect to the existing mining activities, the grassland vegetation, agricultural fields and the overall character are indicated in the table below.

Table 1: Summary of the visual assessment of the proposed incline shaft areas and surrounds.

General view of the proposed incline shaft areas and surrounding area, indicating the existing waste rock dumps and mining activities, the agricultural fields and the grassland vegetation.




Climate (Appendix C)	As a result of climate variations throughout the year, the appearance and perception of the landscape within the surroundings of the proposed incline shaft areas changes with the seasons in terms of the chroma of the area. Early morning and evening mist often associated with these areas, can limit the visibility of the proposed incline shaft areas at different times during the day, particularly at further distances. Since the Mpumalanga Province falls within the region that is characterised by summer rainfall, the visibility of the proposed incline shafts are likely to be lower during the summer months especially during heavy rainfalls. Seasonal variation may have some effect on the area from where	**Landscape Character (Appendix E)**	The proposed project is located within an area that is dominated by mining operations interspersed with isolated farmsteads and the town of Ogies. The incline shaft areas 2 and 4 are gently sloping surrounded by mining infrastructure, while incline shaft areas 1 and 3 are within the mining area where the topography has been altered. Key aesthetic aspects of the landscape associated with the proposed incline shaft areas and the surrounding region is described in Appendix E. The landscape of the proposed incline shaft areas and immediate surrounds are considered enclosed since the proposed incline shaft areas are surrounded by active mining operations and cultivated fields. The

	project components would potentially be visible, with visibility expected to be slightly higher during the winter months when seasonal screening effects from vegetation is somewhat lowered and rainfall is limited.		landscape is considered diverse due to the cultivation and mining activities, and the town of Ogies. The existing mining activities present within the landscape, have altered the character of the landscape from a rural setting to a mining setting. As such, the visual impact associated with mining activities are already present in the area, and receptors within the vicinity thereof have grown accustomed to it. As such it can be considered that the proposed incline shaft areas and additional proposed mining operations will not have a negative effect on the landscape character of the area.
Land Use and visual receptors (Appendix D)	The incline shaft areas are characterised by the following land uses: ➢ Incline shaft 1 is characterised by an open cast pit, with adjacent secondary grassland and a small portion of agricultural fields; ➢ Incline shaft 2 is characterised by heavily grazed grasslands, a small portion of natural wetlands and mining and agricultural activities; ➢ Incline shaft 3 is characterised by mining activities; and ➢ Incline shaft 4 is characterised by natural and modified wetlands, secondary grassland and minor mining activities. The closest town to the GGV is Ogies which is located approximately 1 km north north west of incline shaft 1. According to the protected area databases (SAPAD (2021), SACAD (2021) and NPAES (2009)), there are no protected or conservation areas located within a 10 km radius of the proposed incline shaft areas. Permanent residents in the area, people at their place of work and motorists traveling along roads are all considered sensitive receptors, and the degree to which they are sensitive to the surrounding landscape does however vary. Due to the existing mining activities present in the area, the residents and workers and motorists traveling in the area have grown accustomed to the mining setting and mining silhouette therefore the sensitivity of these receptors may be considered moderate to low. Furthermore, motorists traveling along the roads have momentary views of the surroundings thus these receptors are considered to have a definite low sensitivity. The following roads are present in the surrounding area: R545 (R52), R555 (R29) and R53 transects and pass the MRA, and various gravel farm roads. These roads carry significant coal traffic and are defined as ESKOM Coal Haulage roads, with up to 20% of the traffic being heavy vehicles. Furthermore, these roads are mostly utilised either by mine workers traveling to and from work or farm workers, as such the sensitivity of these roads are low.	**Visual Absorption Capacity (VAC) (Appendix F)**	**Medium (Score 11)** The VAC of the area is considered medium, indicating that the proposed project will be moderately absorbed in the area resulting in a relatively low visual intrusion, thus the proposed project will blend in with the surroundings. The existing mining operations are the main contributing factor to the medium VAC and with the relatively low height of the proposed infrastructure in comparison to the already existing mining structures, the proposed incline shaft areas are insignificant. As the landscape is already affected by mining activities and other anthropogenic activities, the proposed project will not degenerate the visual quality and overall change of the identified landscape character type.
		Landscape Quality (Appendix G)	**Low (Score 6)** The landscape associated with the proposed incline shaft areas and surroundings provide some topographical variety in the form of sloping topography, grassland vegetation, watercourses and mining structures forming part of the skyline. Since incline shaft areas 1 and 3 are within the mining area with limited to no vegetation and incline shaft areas 2 and 4 dominated mostly by graminoid species there is limited variety in terms of vegetation. There is subtle variety in colour and contrast in soil and vegetation, with shades of brown, black and green from the mining structures and grasslands and cultivated fields. Due to existing mining infrastructure and other anthropogenic structures such as houses and schools in the town of Ogies, gravel roads, powerlines and fences, the proposed project will not introduce discordant elements into the environment.
Topography	The local topography of the proposed incline shaft areas 1 and 3 have been severely altered by active mining activities, as incline shaft 1 is situated in an opencast pit and incline shaft 3 is situated at a dump. Incline shaft areas 2 and 4 consists of flat to slightly undulating plains, and is surrounded by mining infrastructure which form part of the skyline. Please refer to Figures 3 and 4 for the elevation and slope models of the area. Even though the topography of the area has been altered by the mining operations, the	**Landscape Value (Appendix H)**	Emalahleni Local Municipality and the Nkangala District Municipality's (DM) economy is characterised by mining and agriculture. The District's economy is dominated by electricity, manufacturing and mining. The Nkangala DM is at the economic hub of Mpumalanga, and is rich in minerals and natural resources. The landscape value of the

	dumps forming part of the skyline will result in the incline shafts not being visually significantly intrusive nor significantly visible.		area is therefore considered moderately high. As the proposed project forms part of the mining sector it will not have a negative impact on the landscape value of the area, as it is likely to increase the economic growth of the district.
Vegetation Cover (Appendix C)	The proposed incline shaft areas fall within a single biome and bioregion according to Mucina & Rutherford (2012) namely; Grassland Biome and Mesic Highveld Bioregion. The Eastern Highveld Grassland vegetation type characterises the region. Based on the field assessment the habitat within the proposed incline shaft areas are predominantly transformed and modified habitat with few portions classified as natural habitat. The incline shaft areas 1 and 3 does not have much vegetation left since it is mostly transformed by active mining areas, while incline shaft areas 2 and 4 are mostly dominated by grass species. The proposed incline shaft areas had Alien Invasive Plants (AIPs) noted throughout. For further detail on the floral ecology of the proposed incline shaft areas refer to the Floral Report (STS, 2022). Since the proposed incline shaft areas are either associated with active mining activities (hence limited to no vegetation) or grasslands, the vegetative component of the area provides limited screening ability.	**Sense of Place**	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. It is created by the land use, character and quality of a landscape, as well as by the tangible and intangible value assigned thereto. The sense of place associated with the proposed incline shaft areas are related to the landscape character type, defined as a mining setting interspersed with farmsteads and cultivated fields with gently undulating terrain. With the proposed incline shaft areas situated within an active mining area the sense of place of the area can further be described as busy with mining operations taking place 24 hours a day 7 days a week. The sense of place extends to a large portion of the Mpumalanga Province especially within the surrounding towns – Coalville, Kendal, Kriel, Delmas etc. As the landscape is already accustomed to mining activities, the proposed project will not have a significant effect on the sense of place of the larger area.
Night Time Lighting (Appendix I)			
The proposed incline shaft areas in its current state contains no direct lighting sources, however the existing mining activities act as an extensive source of high-level night-time lighting. Medium level light sources impacting on the area also originate from the town of Ogies located 1 km north west and the farmsteads in the surrounding area. The lighting environment of the region is therefore considered Suburban with medium district brightness (Zone E3). This corresponds with Bortle's Scale – indicating that the GGV area falls within Class 4 area (rural / suburban transition) where there is low light pollution, with distinct and large objects on the ground that have lights. Furthermore, it is evident that on a cloudy night the lights will be visible in the distance. As a result of the existing night-time light sources, lighting levels are not expected to significantly increase in this area due to the proposed infrastructure. The proposed project is expected to somewhat contribute to the effects of sky glow and artificial lighting in the region, particularly as a result of stationary lighting sources including security lighting, however this impact will not be highly significant due to the high level of existing night time lighting associated with GGV Mine. Sky glow refers to the night-time brightening of skies, caused by the scattering and redirecting of light in the atmosphere, by water droplets and dust in the air, back towards the ground. Such stray light mostly comes from poorly designed and improperly aimed light, and from light reflected from over-lit areas (ASSA, 2012). In addition, the impacts of vehicle mounted lighting sources in the area will generally be confined to the local and sub-regional setting (up to 10km from the proposed incline shaft areas) due to the effects of distance, intervening undulating topography and vegetation which restrict the potential impact on views from more distant regional points.			
Visual Exposure and Visibility and Key Observation Points (KOPs) (Appendix J)			
Taking the VAC (vegetation and topography) of the surrounding environment into consideration, the proposed incline shaft areas will not be highly visible to sensitive receptors situated further than 2km. The proposed project is therefore considered to be in the moderately low visibility zone to any receptors situated further than 2km, predominantly due to the backdrop of the existing mining infrastructure. From the viewshed analysis, it was found that the proposed incline shaft areas will be visible from receptors or vantage points situated in all directions and within 2 km of the proposed incline shaft areas, which included farmsteads and portions of the town of Ogies. Since the viewshed analysis does not take into account the existing anthropogenic structures such as all the latest GGV dumps and opencast areas and vegetation, the viewshed analysis indicated that the proposed infrastructure is highly likely to be visible from portions of R545 road. Based on the field assessment, the view towards the proposed incline shaft areas from portions of the R545 are screened due to existing mining infrastructure and the undulating topography of the area. The viewshed becomes scattered from 2 km onwards, indicating that receptors located further than 2 km will not have a clear line of sight towards the proposed incline shaft areas. Beyond 3 km, the proposed incline shaft areas will definitely not be visible, due to visual exposure and visibility expected to significantly and exponentially decrease with objects being difficult to distinguish from the background at such significant distances. Figures 10 to 12 below indicate the views towards the proposed incline shaft areas, indicating that local cultivated fields and existing mining operations screen the views towards the proposed incline shaft areas.			

Impact Significance, Business case, Conclusion and Mitigation Requirements:	As mentioned, the proposed incline shaft areas are situated within a mining landscape, hence the visual impact associated with the proposed incline shafts is anticipated to be low. In the event that the previously authorised opencast mining takes place and the proposed incline shafts are placed in the high walls, the visual impact of the proposed incline shafts can be considered negligible.

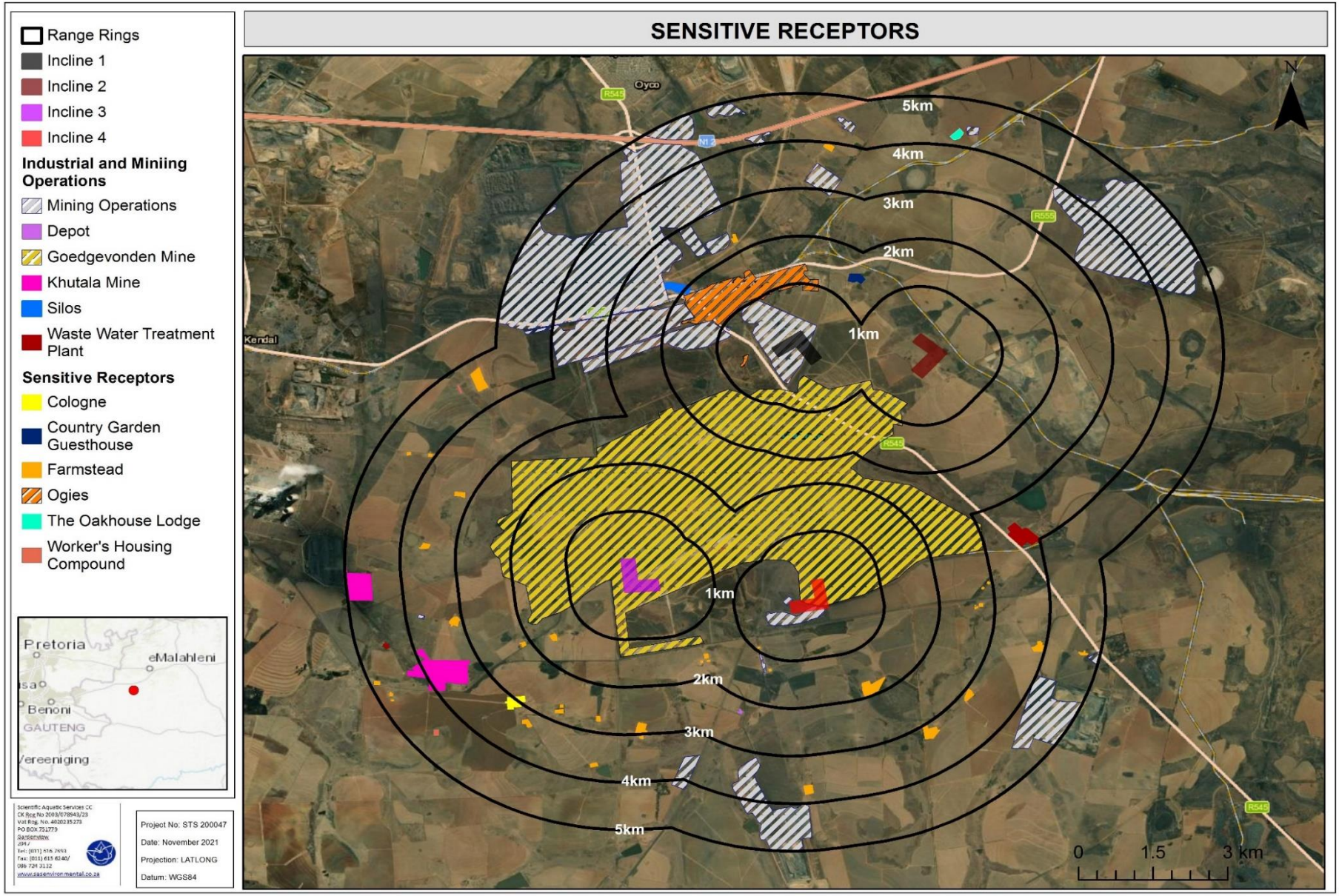


Figure 6: Map indicating the location of potential visual receptors within 5km of the proposed incline shaft areas.

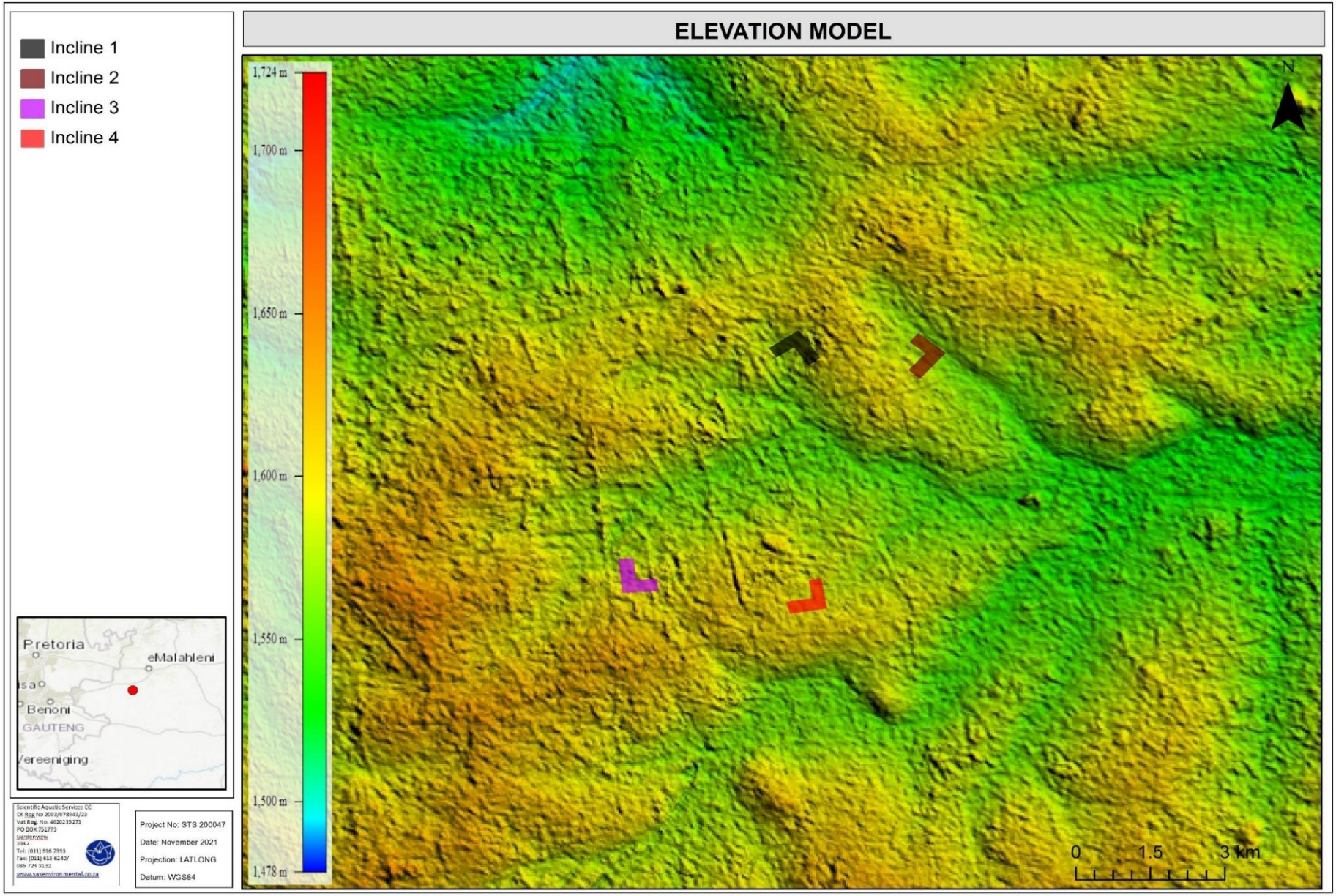


Figure 7: False colour elevation rendering depicting the topographical character of the proposed incline shaft areas.

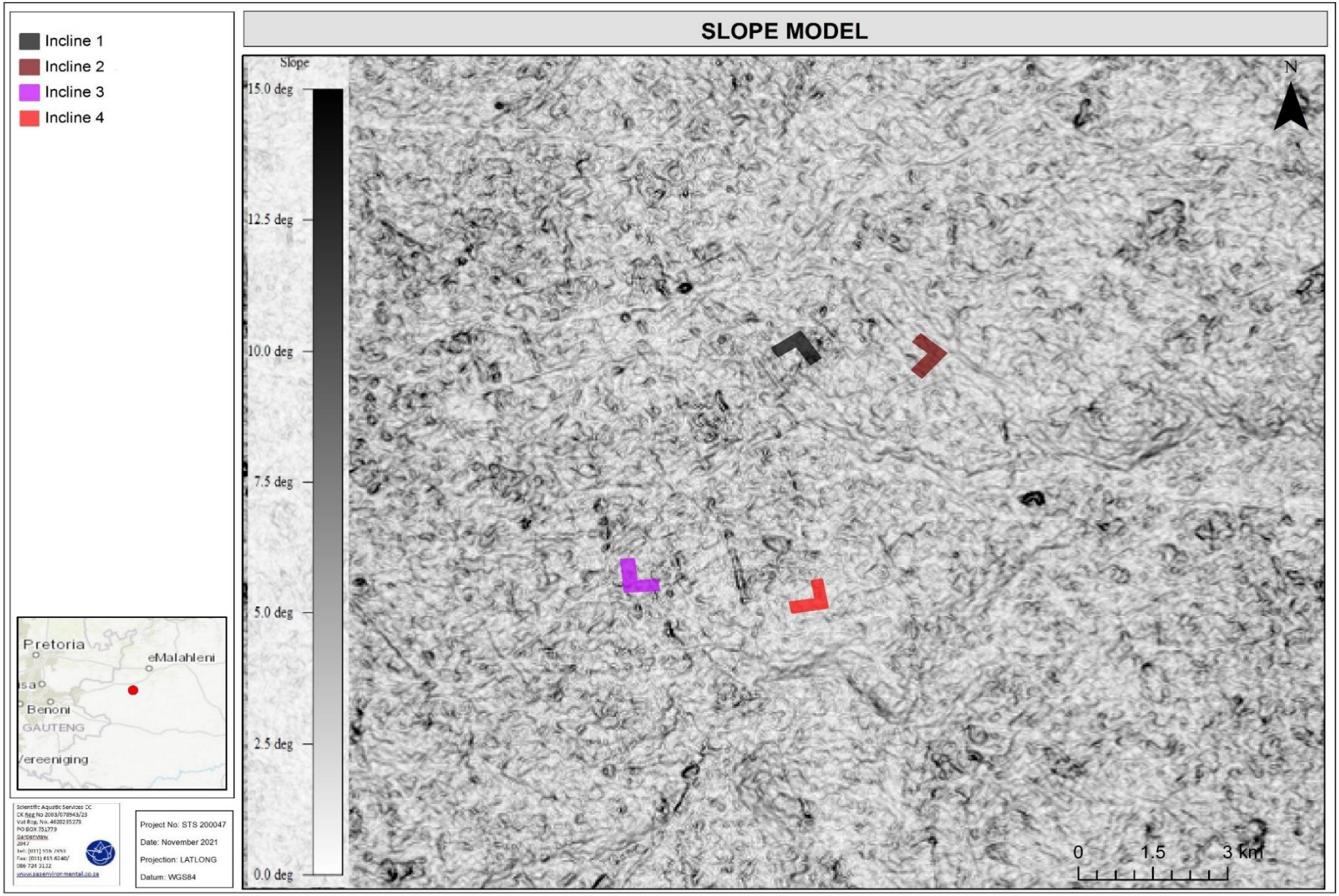


Figure 8: Monochromatic map indicating the general relief associated with the proposed incline shaft areas.

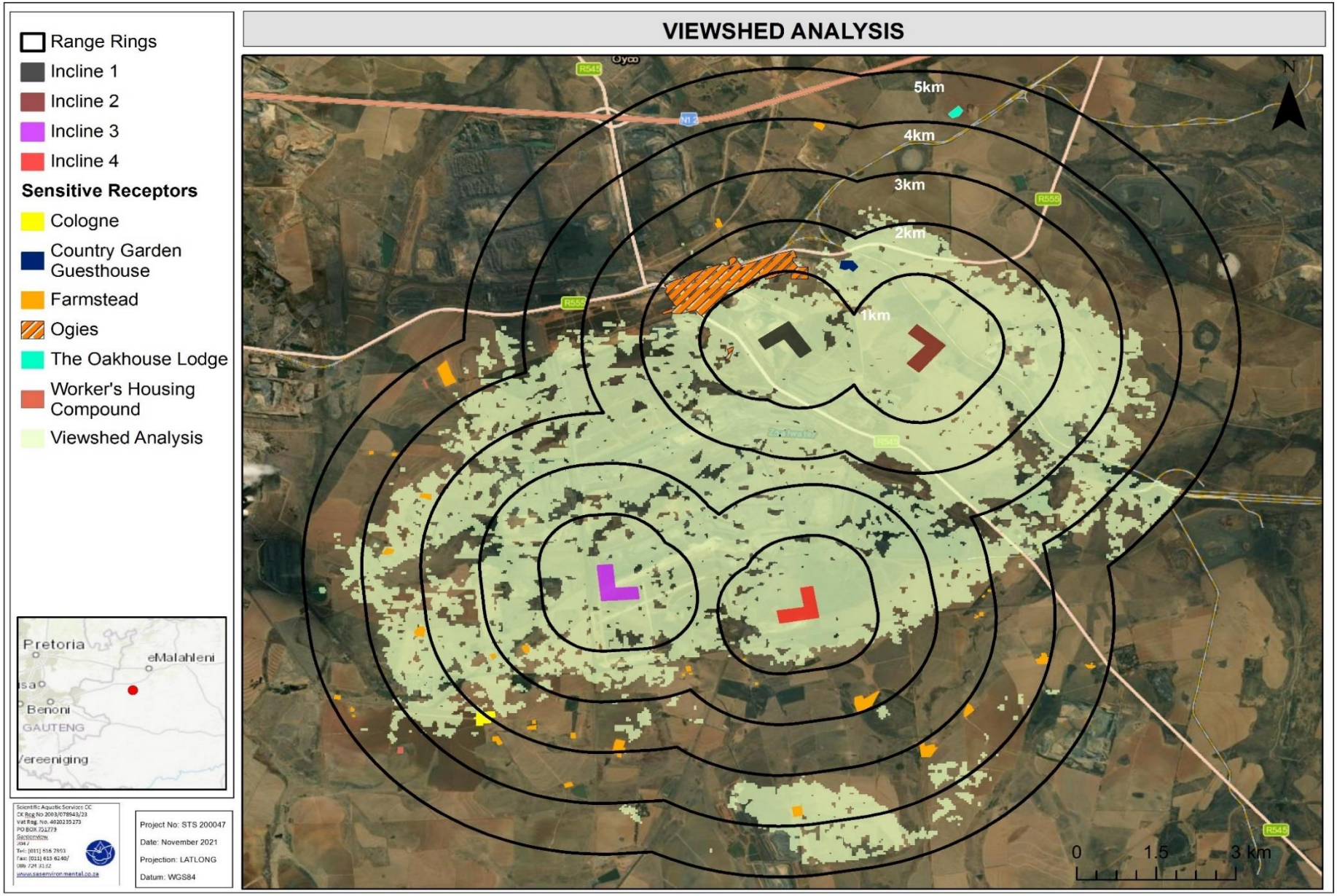


Figure 9: Viewshed (indicated as shaded areas) of the proposed incline shaft areas overlaid onto digital satellite imagery.

Figure 10: Conceptual rendering of the view the R545 where the proposed incline shaft areas will not be visible in the distance (indicated by dashed red arrow).

Figure 11: View from the Ogies Animal Clinic and Country Garden Guest House north north east of the proposed incline shaft areas. The cultivated fields (top) and trees associated with the buildings (bottom) serve to screen the proposed incline shafts.

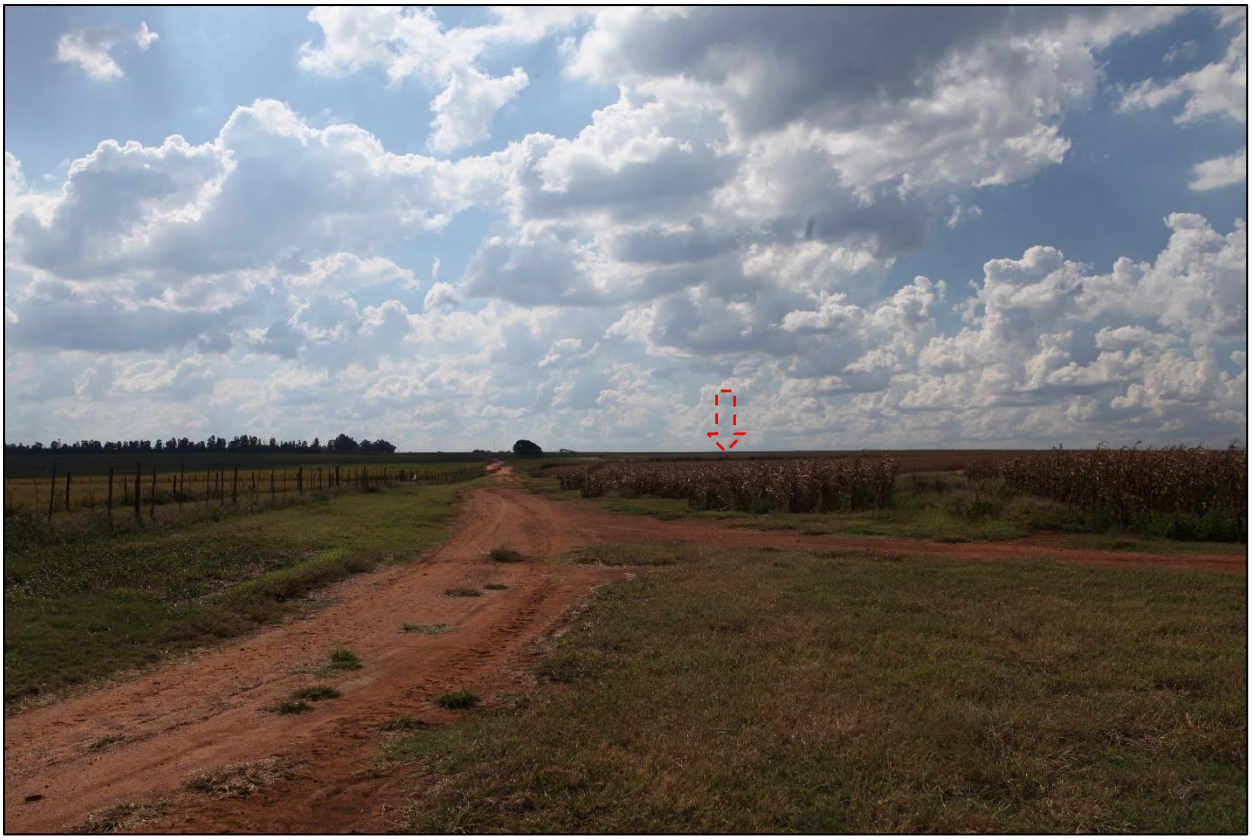


Figure 12: View from a gravel road next to farm worker's houses approximately 2 km south of the proposed incline shaft areas, where due to undulating topography the proposed incline shafts will not be visible (dashed red arrow).

5 RISK ASSESSMENT

This section presents the significance of potential risk on the aesthetics of the landscape associated with the proposed mining activities. In addition, it indicates the required mitigatory measures needed to minimise the perceived risk thereof and presents an assessment of the significance of the risks taking into consideration the available mitigatory measures and assuming that they are fully implemented. The Glencore Risk Assessment Matrix (method outlined in Appendix B) was used to ascertain the risk significance of potential impacts to the receiving visual environment.

Given the existing current GGV mine plan, the areas indicated on the maps wherein the proposed incline shaft areas are located fall within the extent of future approved opencast pits (refer to Figure 5). The proposed incline shafts will be developed in the high wall of the opencast pit area to access the remaining coal reserves underground. With this approach followed, the impacts to the receiving visual environment will be minimal to almost inconsequential levels as the visual environment has already been transformed into a mining landscape. Some impact from additional lighting may occur. Attention will therefore be given to closure and rehabilitation to ensure an appropriate post closure landscape that supports the principles of Integrated Environmental Management and Sustainable Development.

Since the proposed underground blocks will not have any surface infrastructure associated with it these areas were not assessed during the risk assessment, nor was the proposed new road alignment as it is situated within the active mining area of GGV, hence the dumps are screening the view thereof.

After consideration of the findings of these assessments, recommendations and mitigation measures have been developed which will assist in minimising the proposed project’s visual impact during the closure and rehabilitation phase of the project.

5.1 Potential Impacts on the Visual Environment

Table 2: Risk assessment of potential visual impacts on the receiving environment from the proposed mining project activities.

RISK REGISTER								
Aspect	**Risk Event & Cause**	**With or Without Mitigation**	**Risk Event Likelihood**	**Potential Consequences**	**Consequence Category**	**Consequence**	**Current Risk Rating**	**Mitigation Action**
MINING (CONSTRUCTION & OPERATIONAL) PHASE								
Visual	Increased Visual Intrusion and Visibility of the proposed infrastructure	Pre-Mitigation	E	- Construction of further surface infrastructure including stockpiles, silos and reservoirs potentially increasing visual exposure and visibility. - Excavation and blasting during construction. - Further dust generation due to movement of construction vehicles and excavation activities. - Continual stockpiling of material, including the resource, and potentially increasing the heights thereof. - Night time lighting due to security lighting and 24 hour mining operations, adding to the skyglow of the area.	Environment	2	3 (L)	• It must be ensured that vegetation clearing does not occur beyond the already mined footprint area. • Excavation is to be kept to a minimum and limited to essential areas. • It must be ensured that the stockpiles are not steeply sloped, so as to blend in with the existing dumps and undulating terrain of the surrounding environment. • The sites should be kept neat and tidy at all times. • Once construction activities have been completed, it must be ensured that all temporary and construction-related infrastructure be removed and that efficient rehabilitation to take place within these areas. • Natural colours should be used in all instances and the use of highly reflective material should be avoided. Any metal surfaces should be painted to fit in with the natural environment in a colour that blends in effectively with the background. White structures are to be avoided as these will contrast significantly with the natural surroundings. • The identification of appropriate colours and textures for facility materials should take into account both summer and winter appearance. • The relevant exposed construction site areas and internal access roads should be irrigated on a regular basis, with just enough moisture to keep the dust down without creating undue runoff. • All lights used for illumination (except for lighting associated with security) should be faced inwards and shielded to avoid light escaping above the horizon. • The use of high light masts and high pole top security lighting should be avoided along the periphery of the buildings. Any high lighting masts should be covered to reduce sky glow. • Up-lighting of structures must be avoided, with lighting installed at downward angles that provide precisely directed illumination beyond the immediate surroundings of the infrastructure, thereby minimising the light spill and trespass; • Care should be taken when selecting luminaries to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum. Only “full cut-off” light fixtures that direct light only below the horizontal must be used on the buildings. • Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light's purpose. • The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent reduces skyglow and wildlife impacts.
		Post-Mitigation	E		Environment	2	3 (L)	
	Increased sources of Night Time Lighting	Pre-Mitigation	E		Environment	2	3 (L)	
		Post-Mitigation	E		Environment	1	1 (L)	

DECOMMISSIONING AND CLOSURE PHASE								
Visual	Visual Exposure and Visibility of the proposed infrastructure	Pre-Mitigation	C	- Demolition and removal of infrastructure leading to dust generation, erosion and changes in the visual character of the area. - Ineffective removal of infrastructure and closure of opencast pit, resulting in a void in the landscape - Ineffective rehabilitation leading to poor vegetation cover or and permanent scarring of the landscape. - Ongoing proliferation of alien vegetation	Environment	3	13 (M)	• Decommissioning and demolition of footprints and adjacent disturbed areas should be kept as small as possible and no further vegetation should be cleared or soils exposed for this purpose. • All areas where infrastructure is removed must be resloped to resemble the pre-development landscape and revegetated as soon as possible, and as far as is practical and feasible. • Should it be practical and feasible, the opencast pit area should be backfilled and proper rehabilitation and landscaping should occur in this area to resemble pre-mining activities and to ensure that a void is not left in the landscape, which would result in permanent visual scarring of the landscape. • Indigenous and locally occurring plant species for use in re-vegetation should be selected taken quick growth rates into consideration in order to cover bare areas and prevent soil erosion. • The stockpile areas should be rehabilitated and sloped in such a manner that it blends in with the surrounding terrain. • Ongoing alien invasive species management should take place during and after the decommissioning phase of the project. • Where practically feasible, decommissioning should take place during the daylight hours to avoid further use of light sources at night.
		Post-Mitigation	C		Environment	2	8 (M)	
	Increased sources of Night Time Lighting	Pre-Mitigation	E		Environment	2	3 (L)	
		Post-Mitigation	E		Environment	1	1 (L)	

5.2 Cumulative Impacts

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. As mining is one of the major contributing factors to the economic growth of the municipality, several future planned mining activities are proposed within the area along with the already approved opencast mining activities for GGV. Therefore, the cumulative visual impact resulting from landscape modifications as a result of the proposed project, existing mining activities and future planned mining activities is likely to be of increased significance. The cumulative impact of additional traffic and the movement of heavy vehicles through the area on the local and regional roads as well as combined impacts from night-time lighting will also affect the sense of place of the larger region. Furthermore, the additional mining activities that are planned for this project and future projects will increase the overall bulk appearance of mining infrastructure in the area, and some will become closer to the town of Ogies.

5.3 Residual Impacts

It is possible that after all surface infrastructure have been removed scarring of the terrain may remain present post-closure. Indigenous vegetation of the area may be permanently lost or altered and reinstatement of the natural vegetation may not be possible, even should rehabilitation take place, leading to a long term change in the landscape character. The possibility also exists that rehabilitation efforts, including revegetation of impacted areas be unsuccessful, which will lead to a long term or permanent visual impact in the area.

6 CONCLUSION

Since the proposed mining activities will be underground mining these areas were not assessed during the field assessment, as there will be no infrastructure above ground. As such, the field assessment focused on the four incline shaft areas. Although the baseline study was undertaken considering the prevailing conditions (Grassland, farmland and freshwater ecosystems) at the time of the assessment in December 2020 and April 2022, it is acknowledged that authorization has previously been granted for opencast mining within the assessed areas. At the time of preparing this report, the mine plan entails undertaking opencast mining prior to the proposed underground mining, and as a result the proposed incline shafts will be developed into the high walls of the opencast areas. The data and discussions presented within this report are however based on the current state of the environment, i.e., pre-opencast mining. The risk assessment was however undertaken based on the chronological order of the proposed mine plan, i.e. that the opencast mining will occur prior to the development of the inclines. Should the mine plan change, the risk assessment will need to be revised accordingly to adequately consider the impact of the proposed development.

Based on the outcome of the field assessment it is evident that the proposed incline shafts 1, 3 and 4 are located within the GGV active mining area which are surrounded by dumps, or located within the open pit area (incline shaft 1) thus obscured partially and completely from the surrounding sensitive receptors. Since the proposed incline shafts are located within areas where active mining is taking place, the proposed incline shafts will not be significantly visually intrusive on the receiving environment. When considering the broader landscape, mining is a dominant land-use and the mining infrastructure (dumps and Tailings Storage Facilities(TSFs)) form prominent features in the landscape, hence the proposed incline shafts will blend in with the already existing mining infrastructure. As such the proposed incline shafts will blend into the background and will be relatively indistinguishable from the other mining infrastructure.

The incline shaft areas are characterised by the following land uses; mining and agricultural activities and natural and modified wetlands, and secondary grassland. The closest town to GGV is Ogies which is located approximately 1 km north north west of incline shaft 1. Permanent residents in the area, people at their place of work and motorists traveling along roads are all considered sensitive receptors, and the degree to which they are sensitive to the surrounding landscape does however vary. Due to the existing mining activities present in the area, the residents, workers and motorists traveling in the area have grown accustomed to the mining setting and mining silhouette therefore the sensitivity of these receptors may be considered moderate to low.

The local topography of the proposed incline shaft areas 1 and 3 have been severely altered by active mining activities, as incline shaft 1 is situated in an opencast pit and incline shaft 3 is situated at a dump. Incline shaft areas 2 and 4 consists of flat to slightly undulating plains, and is surrounded by mining infrastructure which form part of the skyline. Even though the topography of the area has been altered by the mining operations, the dumps forming part of the skyline will result in the incline shafts not being visually significantly intrusive nor significantly visible.

The habitat within the proposed incline shaft areas are predominantly transformed and modified habitat with few portions classified as natural habitat. The incline shaft areas 1 and 3 does not have much vegetation left since it is mostly transformed by active mining areas, while incline shaft areas 2 and 4 are mostly dominated by graminoid species. Since the proposed incline shaft areas are either associated with active mining activities (hence limited to no vegetation) or grasslands, the vegetative component of the area provides limited screening ability.

The proposed project is located within an area that is dominated by mining operations interspersed with isolated farmsteads and the town of Ogies. The existing mining activities, have altered the character of the landscape from a rural setting to a mining setting. As such, the visual impact associated with mining activities are already present in the area, and receptors within the vicinity thereof have grown accustomed to it. As such it can be considered that the proposed incline shaft areas and additional proposed mining operations will not have a negative effect on the landscape character of the area.

The Visual Absorption Capacity (VAC) of the area is considered medium, indicating that the proposed project will be moderately absorbed in the area resulting in a relatively low visual intrusion, thus the proposed project will blend in with the surroundings. The existing mining operations are the main contributing factor to the medium VAC and with the relatively low height of the proposed infrastructure in comparison to the already existing mining structures, the proposed incline shaft areas are insignificant.

The sense of place associated with the proposed incline shaft areas are related to the landscape character type, defined as a mining setting interspersed with farmsteads and cultivated fields with gently undulating terrain. With the proposed incline shaft areas situated within an active mining area the sense of place of the area can further be described as busy with mining operations taking place 24 hours a day 7 days a week. The sense of place extends to a large portion of the Mpumalanga Province especially within the surrounding towns – Coalville, Kendal, Kriel, Delmas etc. As the landscape is already accustomed to mining activities, the proposed project will not have a significant effect on the sense of place of the larger area.

The existing mining activities act as an extensive source of high-level night-time lighting. Medium level light sources impacting on the area also originate from the town of Ogies located 1 km north north west and the farmsteads in the surrounding area. The lighting environment of the region is therefore considered Suburban with medium district brightness. As a result of the existing night-time light sources, lighting levels are not expected to significantly increase in this area due to the proposed infrastructure.

Should the existing approved mine plan for opencast mining be followed, namely, to develop the proposed incline shafts into the high wall of the opencast pits, the development of the proposed incline shafts and underground mining areas will have a negligible additional visual impact on the receiving environment. On this basis, the outcome of the risk assessment indicated that the risk is deemed to be of ‘low’ significance, since the elevation of the proposed incline shafts are reduced and the area is already significantly disturbed from the opencast mining activities, thus the visual intrusion and visual exposure of the proposed incline shafts

are negligible. As there are existing mining activities within the immediate vicinity, the receptors within the area are accustomed to the mining infrastructure, therefore the proposed project will not have a significant visual impact on the receiving environment. It is the opinion of the specialist that the project be considered acceptable from a visual resource management perspective, provided that the mitigatory measures as outlined in the report are implemented and adhered to as far as possible.

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APPENDIX A – METHOD OF ASSESSMENT

Level of Assessment

The following methods of assessment for determining the level of detail of the assessment was utilised in this report (Oberholzer, 2005):

Table A1: Categories of development and impact severity.

Type of environment	Category 1 development	Category 2 development	Category 3 development	Category 4 development	Category 5 development
Protected/wild areas of international, national or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural, historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural, historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural, historical significance/disturbed	Little or no visual impact expected, possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites/run down areas/ wasteland	Little or no visual impact expected, possible benefits	Little or no visual impact expected, possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

The following key provides an explanation to the categories of development:

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

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

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

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

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

The following box explains the nature of the impacts:

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

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

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

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

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

From the above, the severity of the impact determines the level of the assessment:

Table A2: Impact assessment level of input determination.

Approach	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	Very high visual impact expected
Level of visual input recommended	Level 1	Level 2	Level 3	Level 4	

The following box explains the inputs required at each level of assessment. As indicated in Section 5.2, a Level 4 assessment is required for the proposed project (Oberholzer, 2005).

Level 1 input:
Identification of issues, and site visit;
Brief comment on visual influence of the project and an indication of the expected impacts / benefits.

Level 2 input:
Identification of issues raised in scoping phase, and site visit;
Description of the receiving environment and the proposed project;
Establishment of Receptor Site area and receptors;
Brief indication of potential visual impacts, and possible mitigation measures.

Level 3 assessment:
Identification of issues raised in scoping phase, and site visit;
Description of the receiving environment and the proposed project;
Establishment of Receptor Site area, view corridors, viewpoints and receptors;
Indication of potential visual impacts using established criteria;
Inclusion of potential lighting impacts at night;
Description of alternatives, mitigation measures and monitoring programmes.
Review by independent, experienced visual specialist (if required).

Level 4 assessment:
As per Level 3 assessment, plus complete 3D modelling and simulations, with and without mitigation.
Review by independent, experienced visual specialist (if required).

APPENDIX B – IMPACT ASSESSMENT METHODOLOGY

For the Environmental Assessment Practitioner (EAP) to allow for sufficient consideration of all environmental impacts, impacts were assessed using method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for the impact assessment is outline below.

Table B1: Glencore Corporate Risk Matrix.

	Health & Safety	Environment	Financial Impact	Image & Reputation / Community	Legal & Compliance
5 Catastrophic	• Multiple fatalities (5 or more fatalities in a single incident) • Multiple cases (5 or more) of Permanent Damage Injuries or Diseases that result in permanent disabilities in a single incident	• Unconfined and widespread • Environmental damage or effect (permanent; >10 years) • Requires major remediation	• >$500M operating profit • >$200M property damage	• Loss of multiple major customers or large proportion of sales contracts • Sustained campaign by one or more international NGOs resulting in physical impact on the assets or loss of ability to operate • Security incident resulting in multiple fatalities or major equipment damage • Formal expression of significant dissatisfaction by government • Grievance from internal or external stakeholder alleging human rights violation resulting in multiple fatalities • Loss of multiple major customers or large proportion of sales contracts	• Major litigation / prosecution at Glencore corporate level • Nationalisation / loss of licence to operate

4 Major	• Single incident resulting in: Less than 5 Fatalities • Permanent Damage Injury or Disease that results in a permanent disability- less than 5 cases in a single incident	• Long-term (2 to 10 years) impact • Requires significant remediation	• $100-500M operating profit • $50-200M property damage	• Security/ stakeholder incident resulting in single loss of life or equipment damage • Grievance from internal or external stakeholder alleging human rights violation resulting in single fatality or serious injuries • Topic of broad societal concern and criticism • Negative media coverage at international level resulting in a Corporate statement within 24 hours • Investigation from government and/ or international (or high-profile) NGOs • Complaints from multiple "final" customers • Loss of major customer • Negative impact on share price	• Major litigation / prosecution at Department level
3 Moderate	• Lost Time Injury (LTI) • Lost Time Disease (LTD) • Permanent Disabling Injury (PDI) • Permanent Disabling Disease (PDD) • Single incident that results in multiple medical treatments	• Medium-term (<2 years) impact (typically within a year) • Requires moderate remediation	• $50-100M operating profit • $5-50M property damage	• Negative media coverage at national level over more than one day • Complaint from a "final" customer • Off-spec product • Local Stakeholder action resulting in national societal scrutiny	• Major litigation / prosecution at Operation level

2 Minor	• Medical Treatment Injury (MTI) • Medical Treatment Disease (MTD) • Restricted Work Injury (RWI) • Restricted Work Disease (RWD)	• Near source • Short-term impact (typically <week) • Requires minor remediation	• $5-50M operating profit • $1-5M property damage	• Negative local/ regional media coverage • Complaint received from an internal or external stakeholder	• Regulation breaches resulting in fine or litigation
1 Negligible	• First Aid Injury (FAI) or illness (not considered disease or disorder)	• Near source and confined • No lasting environmental damage or effect (typically <day) • Requires minor or no remediation	• <$5M operating profit • <$1M property damage	• Negligible media interest	• Regulation breaches without fine or litigation

Table B2: Impact Assessment criteria – Impact Significance based on Consequence and Probability

CONSEQUENCE [potential foreseeable outcome of the event]	LIKELIHOOD [of the event occurring with that consequence]					
	Basis of Rating	**E - Rare**	**D - Unlikely**	**C - Possible**	**B - Likely**	**A – Almost Certain**
	Lifetime	Unlikely to occur during a lifetime	Could occur about once during a lifetime	Could occur more than once during a lifetime	May occur about once per year	May occur several times per year
	OR	OR	OR	OR	OR	OR
	Project or Trial or Fixed Time Period	Very unlikely to occur	More likely NOT to occur than to occur	As likely to occur as not to occur	More likely to occur than not occur	Expected to occur
	OR	OR	OR	OR	OR	OR
	New Process / Plant / R&D	No known occurrences in broader worldwide industry	Has occurred at least once in broader worldwide industry	Has occurred at least once in the mining / commodities trading industries	Has occurred at least once within Glencore	Has occurred several times within Glencore
5 Catastrophic		**15 (M)**	**19 (H)**	**22 (H)**	**24 (H)**	**25 (H)**
4 Major		**10 (M)**	**14 (M)**	**18 (H)**	**21 (H)**	**23 (H)**
3 Moderate		**6 (L)**	**9 (M)**	**13 (M)**	**17 (H)**	**20 (H)**
2 Minor		**3 (L)**	**5 (L)**	**8 (M)**	**12 (M)**	**16 (M)**
1 Negligible		**1 (L)**	**2 (L)**	**4 (L)**	**7 (M)**	**11 (M)**

Consequence Category	Consequence Type	Ownership	Action
Cat. 5	Catastrophic Hazard	Department / Functional / Operational / Asset Leadership	Quantitative or semi-quantitative risk assessment required.
			Capital expenditure will be justified to achieve ALARP ('As Low As Reasonably Practicable').
			Catastrophic Hazard Management Plans (CHMP) must be implemented where practical, Crisis Management Plans (CMP) tested and Catastrophic Event Recovery Plans (CERP) developed.
Cat. 4	Fatal Hazard	Department / Functional / Operational / Asset Leadership	Glencore SafeWork Fatal Hazard Protocols or appropriate management plans must be applied.
(Health & Safety consequence)			Capital expenditure will be justified to achieve ALARP.
Risk Rank	**Risk Rating**	**Ownership**	**Action**
17 to 25	High Risk	Department / Functional / Operational / Asset Leadership	Install additional HARD and SOFT controls to achieve ALARP.
			Capital expenditure will be justified to achieve ALARP.
7 to 16	Medium Risk	Operational / Asset Leadership	Install additional HARD and SOFT controls if necessary to achieve ALARP.
			Capital expenditure may be justified.
1 to 6	Low Risk	Operational / Asset Leadership	Install additional controls if necessary to achieve ALARP.
			Capital expenditure is not usually justified.

Mitigation Measure Development

According to the DEA *et al.,* (2013) "Rich biodiversity underpins the diverse ecosystems that deliver ecosystem services that are of benefit to people, including the provision of basic services and goods such as clean air, water, food, medicine and fibre; as well as more complex services that regulate and mitigate our climate, protect people and other life forms from natural disaster and provide people with a rich heritage of nature-based cultural traditions. Intact ecological infrastructure contributes significant savings through, for example, the regulation of natural hazards such as storm surges and flooding by which is attenuated by wetlands".

According to the DEA *et al.,* (2013) Ecosystem services can be divided into 4 main categories:

- Provisioning services are the harvestable goods or products obtained from ecosystems such as food, timber, fibre, medicine, and fresh water;
- Cultural services are the non-material benefits such as heritage landscapes and seascapes, recreation, ecotourism, spiritual values and aesthetic enjoyment;
- Regulating services are the benefits obtained from an ecosystem's control of natural processes, such as climate, disease, erosion, water flows, and pollination, as well as protection from natural hazards; and
- Supporting services are the natural processes such as nutrient cycling, soil formation and primary production that maintain the other services.

Loss of biodiversity puts aspects of the economy, wellbeing and quality of life at risk, and reduces socio-economic options for future generations. This is of particular concern for the poor in rural areas who have limited assets and are more dependent on common property resources for their livelihoods. The importance of maintaining biodiversity and intact ecosystems for ensuring on-going provision of ecosystem services, and the consequences of ecosystem change for human well-being, were detailed in a global assessment entitled the Millennium Ecosystem Assessment (MEA, 2005), which established a scientific basis for the need for action to enhance management and conservation of biodiversity.

Sustainable development is enshrined in South Africa's Constitution and laws. The need to sustain biodiversity is directly or indirectly referred to in a number of Acts, not least the National Environmental Management: Biodiversity Act (No. 10 of 2004) (hereafter referred to as the Biodiversity Act), and is fundamental to the notion of sustainable development. In addition, International guidelines and commitments as well as national policies and strategies are important in creating a shared vision for sustainable development in South Africa (DEA *et al.,* 2013).

The primary environmental objective of the Mineral and Petroleum Resources Development Act (MPRDA) is to give effect to the environmental right contained in the South African Constitution. Furthermore, Section 37(2) of the MPRDA states that "any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations".

Pressures on biodiversity are numerous and increasing. According to the DEA *et al.,* (2013) Loss of natural habitat is the single biggest cause of biodiversity loss in South Africa and much of the world. The most severe transformation of habitat arises from the direct conversion of natural habitat for human requirements, including[1]:

- Cultivation and grazing activities;
- Rural and urban development;
- Industrial and mining activities, and
- Infrastructure development.

Impacts on biodiversity can largely take place in four ways (DEA *et al.,* 2013):

- **Direct impacts:** are impacts directly related to the project including project aspects such as site clearing, water abstraction and discharge of water from riverine resources;

[1] Limpopo Province Environment Outlook. A Report on the State of the Environment, 2002. Chapter 4.

- **Indirect impacts:** are impacts associated with a project that may occur within the zone of influence in a project such as surrounding terrestrial areas and downstream areas on water courses;
- **Induced impacts:** are impacts directly attributable to the project but are expected to occur due to the activities of the project. Factors included here are urban sprawl and the development of associated industries; and
- **Cumulative impacts:** can be defined as the sum of the impact of a project as well as the impacts from past, existing and reasonably foreseeable future projects that would affect the same biodiversity resources. Examples include numerous mining operations within the same drainage catchment or numerous residential developments within the same habitat for faunal or floral species.

Given the limited resources available for biodiversity management and conservation, as well as the need for development, efforts to conserve biodiversity need to be strategic, focused and supportive of sustainable development. This is a fundamental principle underpinning South Africa's approach to the management and conservation of its biodiversity and has resulted the definition of a clear mitigation strategy for biodiversity impacts.

'Mitigation' is a broad term that covers all components of the 'mitigation hierarchy' defined hereunder. It involves selecting and implementing measures – amongst others – to conserve biodiversity and to protect, the users of biodiversity and other affected stakeholders from potentially adverse impacts as a result of mining or any other land use. The aim is to prevent adverse impacts from occurring or, where this is unavoidable, to limit their significance to an acceptable level. Offsetting of impacts is considered to be the last option in the mitigation hierarchy for any project.

The mitigation hierarchy in general consists of the following in order of which impacts should be mitigated (DEA *et al.,* 2013):

- **Avoid/prevent impact:** can be done through utilising alternative sites, technology and scale of projects to prevent impacts. In some cases, if impacts are expected to be too high the "no project" option should also be considered, especially where it is expected that the lower levels of mitigation will not be adequate to limit environmental damage and eco-service provision to suitable levels;
- **Minimise impact:** can be done through utilisation of alternatives that will ensure that impacts on biodiversity and ecoservices provision are reduced. Impact minimisation is considered an essential part of any development project;
- **Rehabilitate impact:** is applicable to areas where impact avoidance and minimisation are unavoidable where an attempt to re-instate impacted areas and return them to conditions which are ecologically similar to the pre-project condition or an agreed post project land use, for example arable land. Rehabilitation can however not be considered as the primary mitigation tool as even with significant resources and effort rehabilitation that usually does not lead to adequate replication of the diversity and complexity of the natural system. Rehabilitation often only restores ecological function to some degree to avoid ongoing negative impacts and to minimise aesthetic damage to the setting of a project. Practical rehabilitation should consist of the following phases in best practice:
  - **Structural rehabilitation** which includes physical rehabilitation of areas by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long terms sustainable ecological structure;
  - **Functional rehabilitation** which focuses on ensuring that the ecological functionality of the ecological resources on the focus area supports the intended post closure land use. In this regard special mention is made of the need to ensure the continued functioning and integrity of wetland and riverine areas throughout and after the rehabilitation phase;
  - **Biodiversity reinstatement** which focuses on ensuring that a reasonable level of biodiversity is re-instated to a level that supports the local post closure land uses. In this regard special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community of community suitable for supporting the intended post closure land use; and
  - **Species reinstatement** which focuses on the re-introduction of any ecologically important species which may be important for socio-cultural reasons, ecosystem functioning reasons and for conservation reasons. Species re-instatement need only occur if deemed necessary.

- **Offset impact:** refers to compensating for latent or unavoidable negative impacts on biodiversity. Offsetting should take place to address any impacts deemed to be unacceptable which cannot be mitigated through the other mechanisms in the mitigation hierarchy. The objective of biodiversity offsets should be to ensure no net loss of biodiversity. Biodiversity offsets can be considered to be a last resort to compensate for residual negative impacts on biodiversity.

The significance of residual impacts should be identified on a regional as well as national scale when considering biodiversity conservation initiatives. If the residual impacts lead to irreversible loss or irreplaceable biodiversity the residual impacts should be considered to be of *very high significance* and when residual impacts are considered to be of *very high significance*, offset initiatives are not considered an appropriate way to deal with the magnitude and/or significance of the biodiversity loss. In the case of residual impacts determined to have *medium to high significance*, an offset initiative may be investigated. If the residual biodiversity impacts are considered of low significance no biodiversity offset is required.[2]

In light of the above discussion the following points present the key concepts considered in the development of mitigation measures for the proposed development.

- Mitigation and performance improvement measures and actions that address the risks and impacts[3] are identified and described in as much detail as possible.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation.
- Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, with estimates of the resources (including human resource and training requirements) and responsibilities for implementation wherever possible.

Recommendations

Recommendations were developed to address and mitigate the impacts associated with the proposed development. These recommendations also include general management measures which apply to the proposed development as a whole. Mitigation measures have been developed to address issues in all phases throughout the life of the operation from planning, through to construction and operation.

[2] Provincial Guideline on Biodiversity Offsets, Western Cape, 2007.
[3] Mitigation measures should address both positive and negative impacts

APPENDIX C – VEGETATION TYPE

Figure C1: Gm 12 Eastern Highveld Grassland: Grasslands of the Warburton area (Mpumalanga) with species of *Berkheya* and *Ipomoea* prominent in the foreground. Image by T. Steyn. Information taken from Mucina & Rutherford (2006), page 400.

Table C1: Eastern Highveld Grassland Vegetation type associated with the proposed project area (Mucina & Rutherford, 2012)

Climate	Strongly seasonal summer rainfall, with very dry winters
Altitude (m)	1 520 –1 780 m, but also as low as 1 300 m
MAP* (mm)	726
MAT* (°C)	14.7
MFD* (Days)	32
MAPE* (mm)	1926
MASMS* (%)	73
Distribution	Mpumalanga and Gauteng Provinces: Plains between Belfast in the east and the eastern side of Johannesburg in the west and extending southwards to Bethal, Ermelo and west of Piet Retief.
Geology & Soils	Red to yellow sandy soils of the Ba and Bb land types found on shales and sandstones of the Madzaringwe Formation (Karoo Supergroup). Land types include Bb (65%) and Ba (30%)[4].
Conservation	**Endangered** (as per Mucina & Rutherford (2006); however, the threat status has been updated to a vulnearable (Vu) status in the 2018 Final Vegetation Map of South Africa, Lesotho, and Swaziland (SANBI, 2018a). Target 24%. Only very small fraction conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and in private reserves (Holkranse, Kransbank, Morgenstond). Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building

[4] Land types refer to a class of land with specified characteristics. In South Africa it has been used as a unit denoting land at 1:250 000 scale, over which there is a marked uniformity of climate, terrain form and soil pattern. Land type Ea refers to dark, blocky clay topsoil (often swelling clays) and/or red, structured clays. Land type categories are as follows: Bb = Non-red (Hu, Bv <33%); dystrophic/mesotrophic > eutrophic; Ba = Non-red (Hu, Bv <33%); dystrophic/mesotrophic > eutrophic but with < 10 % clay soils (ARC: Land Type Survey Staff. 1972 – 2006).

	of dams. Cultivation may have had a more extensive impact, indicated by land-cover data. No serious alien invasions are reported, but *Acacia mearnsii* can become dominant in disturbed sites. Erosion is very low.
Vegetation & landscape features	Slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual highveld grass composition (*Aristida*, *Digitaria*, *Eragrostis*, *Themeda*, *Tristachya* etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Senegalia caffra*, *Celtis africana*, *Diospyros lycioides* subsp *lycioides*, *Parinari capensis*, *Protea caffra*, *P. welwitschii* and *Searsia magalismontanum*).

Table C2: Dominant & typical floristic species of *Eastern Highveld Grassland* (Mucina & Rutherford, 2006).

Plant Community	Species
Dominant and typical floristic species	
Woody Layer	
Low Shrubs	*Anthospermum rigidum* subsp. *pumilum*, *Stoebe plumosa*.
Forb layer	
Herbs	*Berkheya setifera* (d), *Haplocarpha scaposa* (d), *Justicia anagalloides* (d), *Pelargonium luridum* (d), *Acalypha angustata*, *Chamaecrista mimosoides*, *Dicoma anomala*, *Euryops gilfillanii, E. transvaalensis* subsp. *setilobus, Helichrysum aureonitens*, *H. caespititium*, *H. callicomum*, *H. oreophilum*, *H. rugulosum*, *Ipomoea crassipes*, *Pentanisia prunelloides* subsp. *latifolia*, *Selago densiflora*, *Senecio coronatus*, *Hilliardiella oligocephala*, *Wahlenbergia undulata*.
Geophytic herbs	*Gladiolus crassifolius*, *Haemanthus humilis* subsp. *hirsutus*, *Hypoxis rigidula* var. *pilosissima*, *Ledebouria ovatifolia*.
Succulent herbs	*Aloe ecklonis*.
Graminoid layer	
Graminoids	*Aristida aequiglumis* (d), *A. congesta* (d), *A. junciformis* subsp. *galpinii* (d), *Brachiaria serrata* (d), *Cynodon dactylon* (d), *Digitaria monodactyla* (d), *D. tricholaenoides* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), *E. curvula* (d), *E. plana* (d), *E. racemosa* (d), *E. sclerantha* (d), *Heteropogon contortus* (d), *Loudetia simplex* (d), *Microchloa caffra* (d), *Monocymbium ceresiiforme* (d), *Setaria sphacelata* (d), *Sporobolus africanus* (d), *S. pectinatus* (d), *Themeda triandra* (d), *Trachypogon spicatus* (d), *Tristachya leucothrix* (d), *T. rehmannii* (d), *Alloteropsis semialata* subsp. *eckloniana*, *Andropogon appendiculatus*, *A. schirensis*, *Bewsia biflora*, *Ctenium concinnum*, *Diheteropogon amplectens*, *Eragrostis capensis*, *E. gummiflua*, *E. patentissima*, *Harpochloa falx*, *Panicum natalense*, *Rendlia altera*, *Schizachyrium sanguineum*, *Setaria nigrirostris*, *Urelytrum agropyroides*.

(d) = dominant species

APPENDIX D – VISUAL RECEPTORS

The number of observers and their perception of the proposed project will have an impact on the VIA and also on the perceived sensitivity of the landscape. The perception of viewers is difficult to determine as there are many variables to consider, such as cultural background, state of mind, reason for the sighting and how often the project is viewed within a set period. It is therefore necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the project. It is also necessary to generalise the viewer sensitivity to the proposed project to some degree (Oberholzer, 2005).

The IEMA (2002) identifies a number of potential sensitive receptors that may be affected by a proposed development, namely:

- Users of recreational landscapes/ public footpaths and bridleways, including tourists and visitors;
- Residents;
- Users of public sports grounds and amenity open space;
- Users of public roads and railways;
- Workers; and
- Views of or from within valued landscapes.

The sensitivity of visual receptors and views will depend on:

- The location and context of the viewpoint;
- The expectation and occupation or activity of the receptor; and
- The importance of the view.

The most sensitive receptors may include:

- Users of outdoor recreational facilities, including public rights of way, whose attention 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; and
- Occupiers of residential properties with views affected by the development.

Other receptors include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscape of acknowledges 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.

APPENDIX E – LANDSCAPE CHARACTER

Landscape character, from an aesthetic perspective, is mainly defined by natural determinants, such as vegetation, geology and topography, as well as cultural factors including land use, settlement patterns and the manner in which humans have transformed their natural surroundings. According to Swanwick (2002), landscape character may be defined as a distinct, recognisable and consistent pattern of elements in the landscape that makes it unique and provides it with a particular sense of place. Individual "landscape elements" that contribute to landscape character include hills, rolling plains, valleys, woods, trees, water bodies, as well as buildings and roads. "Landscape features" are those elements that are prominent or eye-catching.

Landscapes may be divided into landscape character types, which are defined as distinct types of landscape that are relatively homogeneous in character. Such landscape character types are generic in nature and may occur in different areas in different parts of the country, but wherever they occur, they share broadly similar combinations of geology, topography, drainage patterns, vegetation, land use and settlement patterns (Swanwick, 2002).

Key aesthetic aspects of the landscape are described in the table below, according to the method prescribed by Swanwick (2002).

Table E1: Aesthetic and perceptual aspects of landscape character.

Aspect	Characteristics				Motivation
Scale	Intimate	Small	Large	Vast	The scale of the landscape is considered to be **small** since the proposed incline shaft areas are situated within the active GGV mining activities and surrounded by other mining operations.
Enclosure	Tight	Enclosed	Open	Exposed	Since the proposed project is situated within the active mining activities of GGV and surrounded by other mining operations the proposed incline shaft areas are considered to be **enclosed**.
Diversity	Uniform	Simple	Diverse	Complex	The proposed incline shaft areas and surrounding area is characterised by mining activities interspersed with cultivation, and wetlands and the town of Ogies and farmsteads, resulting in the area being **diverse.**
Texture	Smooth	Textured	Rough	Very rough	The texture associated with the landscape is **very rough** due to the coarseness of the mining operations – dumps and buildings, grassland and wetland vegetation, cultivated fields, fences, powerlines and gravel roads.
Form	Vertical	Sloping	Rolling	Horizontal	The dominant form of the landscape is **rolling**, due to the mining infrastructure dominating the landscaping of the surrounding region. With the incline shaft areas 2 and 4 associated with grassland rather than mining activities the landscape is considered **sloping.**
Line	Straight	Angular	Curved	Sinuous	The line landscape element is **sinuous** due to the existing mining infrastructure forming part of the skyline.
Colour	Monochrome	Muted	Colourful	Garish	The colours associated with the landscape are **muted**, with vegetation and mine dumps forming the dominant colour palette of shades of green and brown. Some seasonal colour is however expected.
Balance	Harmonious	Balanced	Discordant	Chaotic	The landscape is considered to be **balanced** in terms of the relationship between the vertical and horizontal landscape elements.

Aspect	Characteristics				Motivation
Pattern	Random	Organised	Regular	Formal	The landscape is considered **regular,** with mining operations dominating the landscape.
Movement	Dead	Still	Calm	Busy	The level of movement within the proposed incline shaft areas are **busy,** since it is within the active mining area of GGV.

In addition to the above, other aspects of landscape perception, such as perception of beauty and scenic attractiveness also play a role in defining landscape character. These aspects are more subjective and responses thereto are personal and based on the experience and preference of the observer. Factors simultaneously perceived by senses other than sight, such as noisiness, tranquillity, exposure to the elements and sense of safety, further influence landscape character.

APPENDIX F – VISUAL ABSORPTION CAPACITY

Visual Absorption Capacity (VAC) refers to the inherent ability of a landscape to accommodate change without degeneration of the visual quality and without resulting in an overall change of the identified landscape character type. A high VAC rating implies a high ability to absorb visual impacts and manmade structures and the ability of natural features such as trees or higher-lying areas to screen or hide an object where it would have visible otherwise (Oberholzer, 2005), while a low VAC rating implies a low ability to absorb or conceal visual impacts.

The factors that have been considered during the VAC analysis are listed and explained in the table below, according to the methodology prescribed by the United States Bureau of Land Management (BLM, 2004) and as adapted to the South African context (Table F1). Five factors have been considered, namely vegetation, soil contrast, visual variety, topographical diversity and recovery time.

Table F1: VAC Factors and Rating table.

Factors	Rating Criteria and Score		
Vegetation	Low, uniform vegetation or sparse vegetative cover, typically less than 1m in height, lacking in variety, uniform colour, minimal screening capability, typically low scrub or grass type vegetation. **Score: 1**	Vegetation of moderate height (1 – 2m), some species variety (2 to 3 types), some variation in colour, mostly continuous vegetative cover, effectively screens low-profile projects such as low-profile surface disturbance, scrub/grass, and intermingled shrubs. **Score: 2**	Higher vegetation (>2m height), lush, continuous vegetative cover; some variety of vegetative types is typical but not mandatory, provides significant screening capability of projects up to 4 – 6m in height, woodlands. **Score: 3**
Soil contrast	Surface disturbance would expose a high degree of contrast in colour with surrounding soil, rock and vegetation. **Score: 1**	Surface disturbance would expose a medium degree of contrast in colour with surrounding soil, rock and vegetation. **Score: 2**	Surface disturbance would expose only a low degree of contrast in colour with surrounding soil, rock and vegetation. **Score: 3**
Visual variety	Rating unit exhibits a low degree of visual variety in terms of the landscape character elements of form, line and texture and may also exhibit minimal variety in landforms, vegetation, or colour. **Score: 1**	Rating unit exhibits a medium degree of visual variety in terms of the landscape character elements of form, line, and texture and may also exhibit medium variety in landforms, vegetation, or colour. **Score: 2**	Rating unit exhibits a high degree of visual variety in terms of the landscape character elements of form, line, and texture and may also exhibit high degree of variety in landforms, vegetation, or colour. **Score: 3**
Topographical diversity	Landform has low amount of topographic diversity and variety. **Score: 1**	Landform has moderate amount of topographic diversity and variety. **Score: 2**	Landform has high amount of topographic diversity and variety. **Score: 3**
Recovery time	Long-term recovery time (greater than 5 years) **Score: 1**	Medium recovery time (3 to 5 years) **Score: 2**	High (rapid) recovery time (1 to 2 years) **Score: 3**

Scores, when added, amounting to between 5 and 7 are categorised as Low, scores between 8 and 11 as Medium and between 12 and 15 as High.

VAC is further closely related to visual intrusion, which refers to the physical characteristics and nature of the contrast created by a project on the visual aspects of the receiving environment. It is also, as with VAC, a measure of the compatibility or conflict of a project with the existing landscape and surrounding land use. The visual intrusion ratings are listed in the table below.

Table F2: Visual intrusion ratings.

Rating	Explanation
High visual intrusion	Results in a noticeable change or is discordant with the surroundings.
Moderate visual intrusion	Partially fits into the surroundings, but clearly noticeable.
Low visual intrusion	Minimal change or blends in well with the surroundings.

Through applying the scoring categories as outlined above, the following scores have been calculated for the proposed project area, which have similar landscape characteristics:

Table F3: VAC Scores achieved.

Factor	Score obtained	Motivation
Vegetation	**1**	With incline shaft areas 1 and 3 being situated within active mining areas, there are limited to no vegetation, while incline shaft areas 2 and 4 have a low height vegetative cover (grass species), thus the vegetative component of the area will not assist in absorbing the proposed incline shaft areas.
Soil contrast	**3**	Surface disturbance would result in a low degree of contrast in colour with the surrounding area due to the active mining areas, gravel roads and bare patches throughout the area.
Visual variety	**2**	Visual variety is present in the form of mining infrastructure, powerlines, fences and gravel roads, and cultivated fields which serve to create some visual variety in terms of lines, colour and texture.
Topographical diversity	**3**	The topography of the area is mostly altered due to mining operations in the area, however there is still some form of natural gently sloping and undulating topography.
Recovery time	**2**	Due to the dominant vegetation within the proposed incline shaft areas comprising graminoids, recovery time is expected to be moderate.
Total	**11**	**Medium**

APPENDIX G – LANDSCAPE QUALITY

Landscape visual quality, integrity or 'scenery beauty' relates primarily to human impact on a landscape and the physical state of the landscape in terms of intactness from visual, functional and ecological perspectives (Swanwick, 2002). It also serves as an indication of the condition of landscape elements and features (as outlined in Section 5.3.5), which in turn depends largely on an observer's visual perception through either increasing or reducing the visual quality of a landscape. Visual quality is thus a factor of an observer's emotional response to physical landscape characteristics and therefore assigning values to visual resources is a subjective process.

According to the BLM Visual Resource Management (VRM) system (1984), a system specifically developed for minimising the visual impacts of surface-disturbing activities and maintaining scenic values for the future, landscape, visual and scenic quality evaluation may be determined based on seven key factors, as outlined in the tables below and adapted to the South African environment. It is important to note that there may 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, however within the context of the proposed project, this method of assessment is deemed suitable as an indication of landscape quality.

Table G1: Landscape Quality - Explanation of Rating Criteria.

Factor	Definition
Landform	Topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured. Outstanding landforms may be monumental or they may be exceedingly artistic and subtle.
Vegetation	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. Consider also smaller scale vegetation features, which add striking and intriguing detail elements to the landscape.
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 that would normally rate very low in score, but the influence of the adjacent unit would enhance the visual quality and raise the score.
Scarcity	This factor provides an opportunity to give added importance to one or all of the scenic features that appear to be relatively unique or rare within one physiographic region. There may also be cases where a separate evaluation of each of the key factors does not give a true picture of the overall scenic quality of an area. Often it is a number of not so spectacular elements in the proper combination that produces the most pleasing and memorable scenery - the scarcity factor can be used to recognize this type of area and give it the added emphasis it needs.
Cultural Modifications	Cultural modifications in the landform/water, vegetation, and addition of structures should be considered and may detract from the scenery in the form of a negative intrusion or complement or improve the scenic quality of a unit. Rate accordingly.

Table G2: Scenic Quality - Rating Criteria and scoring system.

Factor	Rating Criteria and Score		
Landform	High vertical relief as expressed in prominent cliffs, spires, massive rock outcrops, areas of severe surface variation, highly eroded formations, dune systems or detail features that are dominant and exceptionally striking and intriguing. **Score: 5**	Steep canyons, mesas, buttes, interesting erosional patterns, landforms of variety in size and shape or detail features, which are interesting though not dominant or exceptional. **Score 3**	Low rolling hills, foothills, or flat valley bottoms or few or no interesting landscape features. **Score: 1**
Vegetation	A variety of vegetative types as expressed in interesting forms, textures, and patterns. **Score: 5**	Some variety of vegetation, but only one or two major types. **Score: 3**	Little or no variety or contrast in vegetation. **Score: 1**
Water	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. **Score: 5**	Flowing, or still, but not dominant in the landscape. **Score: 3**	Absent, or present, but not noticeable. **Score: 0**
Colour	Rich colour combinations, variety or vivid colour; or pleasing contrasts in the soil, rock, vegetation, water or snowfields. **Score: 5**	Some intensity or variety in colours and contrast of the soil, rock and vegetation, but not a dominant scenic element. **Score: 3**	Subtle colour variations, contrast, or interest; generally mute tones. **Score: 1**
Adjacent Scenery	Adjacent scenery greatly enhances visual quality **Score: 5**	Adjacent scenery moderately enhances overall visual quality. **Score: 3**	Adjacent scenery has little or no influence on overall visual quality. **Score: 0**
Scarcity	One of a kind, unusually memorable or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. **Score: 5**	Distinctive, though somewhat similar to others within the region. **Score: 3**	Interesting within its setting, but fairly common within the region. **Score; 1**
Cultural Modifications	Modifications add favourably to visual variety while promoting visual harmony. **Score: 2**	Modifications add little or no visual variety to the area, and introduce no discordant elements **Score: 0**	Modifications add variety but are very discordant and promote strong disharmony. **Score: -4**

Scores, when added, amounting to less than 11, are categorised as Low, scores between 12 and 18 as Medium and scores more than 19 as High.

Through applying the scoring categories as outlined above, the following scores have been calculated for the proposed project area:

Table G3: Scenic Quality – Results and motivation.

Factor	Score obtained	Motivation
Landform	**3**	The landscape associated with the proposed incline shaft areas and surroundings provide some topographical variety in the form of sloping topography, grassland vegetation, watercourses and mining structures forming part of the skyline, leading to increased visual interest.
Vegetation	**1**	Since incline shaft areas 1 and 3 are within the mining area with limited to no vegetation and incline shaft areas 2 and 4 dominated mostly by graminoid species there is limited variety in terms of vegetation.
Water	**0**	There are natural wetlands present within the incline shaft areas 2 and 4 however these were not dominant in the landscape.
Colour	**1**	There is subtle variety in colour and contrast in soil and vegetation, with shades of brown, black and green from the mining structures and grasslands and cultivated fields.
Adjacent Scenery	**0**	With the area being dominated by various mining operations the broader landscape viewing experience is not pleasant and therefore does not enhance the viewing of the landscape.
Scarcity	**1**	The landscape character type is not interesting, as it is dominated by multiple mining operations, and is characteristic of the Mpumalanga Province.
Cultural Modifications	**0**	Due to existing mining infrastructure and other anthropogenic structures such as houses and schools in the town of Ogies, gravel roads, powerlines and fences, the proposed project will not introduce discordant elements into the environment.
Total	**6**	Low

APPENDIX H – LANDSCAPE VALUE

Landscape value is concerned with the relative value that is attached to different landscapes. Landscape values are described as the environmental or cultural benefits, including services and functions that are derived from various landscape attributes (Department of the Environment and Local Government, Ireland (DoE, 2000). A landscape may be valued by different communities for many different reasons without any formal designation, recognising, for example, perceptual aspects such as scenic beauty, tranquillity or wildness, special cultural associations, the influence and presence of other conservation interests, or the existence of a consensus about importance, either nationally or locally (DoE, 2000). These attributes include the components and image of the landscape as already established in the assessment of landscape character, including aesthetic and ecological components, but also includes historical and socio-cultural associations, as well as religious and mythological dimensions.

In determining landscape value, the people or groups of people who could be affected by the proposed development should be considered, due to landscapes being valuable to people in different ways. In this regard, consideration is given to:

- People who live and work in an area may have a different perception of the landscape to that held by visitors because of their more regular contact with the landscape and the ongoing changes within it;
- Special interest, for example the ecological, cultural or historic value of the landscape, as knowledge of these issues can often affect people's perception and appreciation of a landscape; and
- Landscapes valued by a public wider than the local population, because they have a strong image or are well known and valued nationally and internationally.

APPENDIX I – NIGHT TIME LIGHTING

In order to understand the potential visual impacts from night lighting, it is important to understand the existing lighting levels. The Institute of Lighting Engineers (ILP) (2011) identifies five environmental zones for exterior lighting control and with which to describe the existing lighting conditions within the landscape (Table I1). These environmental zones are supported by design guidance for the reduction of light pollution, which can then inform proposed mitigation measures and techniques. Where an area to be lit lies on the boundary of two zones the obtrusive light limitation values used should be those applicable to the most rigorous zone.

Table I1: Environmental zones for night-time lighting.

Environmental Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically Dark	National Parks, Areas of Outstanding Natural Beauty etc.
E2	Rural	Low District Brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium District Brightness	Small town centres or suburban locations
E4	Urban	High District Brightness	Town/city centres with high levels of night-time activity

Stationary lights facing upward are significant contributors to light pollution and causes sky glow and glare, while light facing in a horizontal direction can be visible for long distances, lead to light trespass (light falling outside the desired area of illumination) and be disturbing to viewers and vehicles. Sky glow refers to the night-time brightening of skies, caused by the scattering and redirecting of light in the atmosphere, by water droplets and dust in the air, back towards the ground. Such stray light mostly comes from poorly designed and improperly aimed light, and from light reflected from over-lit areas (ASSA, 2012). Lighting from vehicles within rural areas will generally be more intrusive than in urban settings and, therefore, will have a potentially greater impact due the general lack of existing ambient light within areas further away from the proposed incline shaft areas.

The ILP (2011) recommends that, in order to maintain the night-time setting, lighting within the identified zone should have minimal illumination into the sky as well as to adjacent viewpoints.

Bortle Dark Sky Scale

The Bortle Dark Sky Scale was developed by John Bortle "based on nearly 50 years of observing experience," to describe the amount of light pollution in a night sky. It was first published in a 2001 Sky & Telescope article. The reality behind the use of the scale is the enormous amount of artificial light pushed into the sky by human habitation, as documented on this map below. To facilitate learning and using the scale, Bortle's indicators of sky brightness have been adapted as a table (below), including the color codes used in available light pollution map.

For the amateur astronomer, the most robust and convenient relative measure of sky brightness is the naked eye or telescopic limiting magnitude. This is also a criterion that can be directly reported without recourse to the Bortle classification categories.

To calculate the sky darkness using these charts, simply canvas the entire area of the chart and mark as many stars as you can recognize that are near your averted vision threshold. Do not mark stars that you can identify with direct vision or that are easy with averted vision; try to select stars near your threshold. Identify in this way at least 10 faint stars. Later, tally the number of stars that fall within each magnitude bin shown in the key at bottom left, which identifies the half magnitude steps corresponding

to the Bortle categories. The prevailing sky brightness is the average magnitude of the two faintest bins marked:

SB = (t1*m1 + t2*m2) / (t1+t2)

#t is a tally
*m is the fainter bracket magnitude that defines the magnitude interval bin.

For example, 7 stars of magnitude 5.0–5.49 and 9 stars of magnitude 5.5–5.99, so:

SB = (7*5.5+9*6.0)/(7+9) = (38.5+54)/16 = 5.78 = Bortle 5 (suburban)

The limit magnitude may differ from another observer's, but this difference in visual acuity will transfer to all other visual tasks. The Bortle scale inevitably combines differences in sky brightness and differences in individual detection capabilities.

Number Code	*Map Color Code*	*Label*	*Sky Mag.*	*Naked Eye Limit Mag.*	*320mm Limit Mag.*	*Triangulum Galaxy visible?*	*Andromeda Galaxy visible?*	*Central Galaxy visible?*	*Zodiacal light visible?*	*Light Pollution*	*Clouds*	*Ground Objects*
1		excellent dark sky	22.00–21.99	≥ 7.5	> 17	obvious	.	casts shadows	striking	airglow apparent	.	visible only as silhouettes
2		average dark sky	21.99–21.89	7.0–7.49	16.5	easy with direct vision	.	appears highly structured	bright, faint yellow color	airglow faint	dark everywhere	large near objects vague
3		rural sky	21.89–21.69	6.5–6.99	16.0	easy with averted vision	.	complex structure	obvious	LP on horizon	dark overhead	large distant objects vague
4		rural/suburban transition	21.69–20.49	6.0–6.49	15.5	difficult with averted vision	obvious	only large structures	halfway to zenith	low LP	lit in distance	distant large objects distinct
5		suburban	20.49–19.50	5.5–5.99	14.5–15.0	.	easy with direct vision	washed out	faint	encircling LP	brighter than sky	
6		bright suburban	19.50–18.94	5.0–5.49	14.0–14.5	.	easy with averted vision	visible only near zenith	.	LP to 35°	fairly bright	small close objects distinct
7		suburban/urban transition	18.94–18.38	4.5–4.99	14.0	.	difficult with averted vision	invisible	.	LP to zenith	brilliantly lit	.
8		city sky	< 18.38	4.0–4.49	13	.	.	.	.	bright to 35°	.	headlines legible
9		inner city sky	.	≤ 4.0		.	.	.	.	bright at zenith	.	.

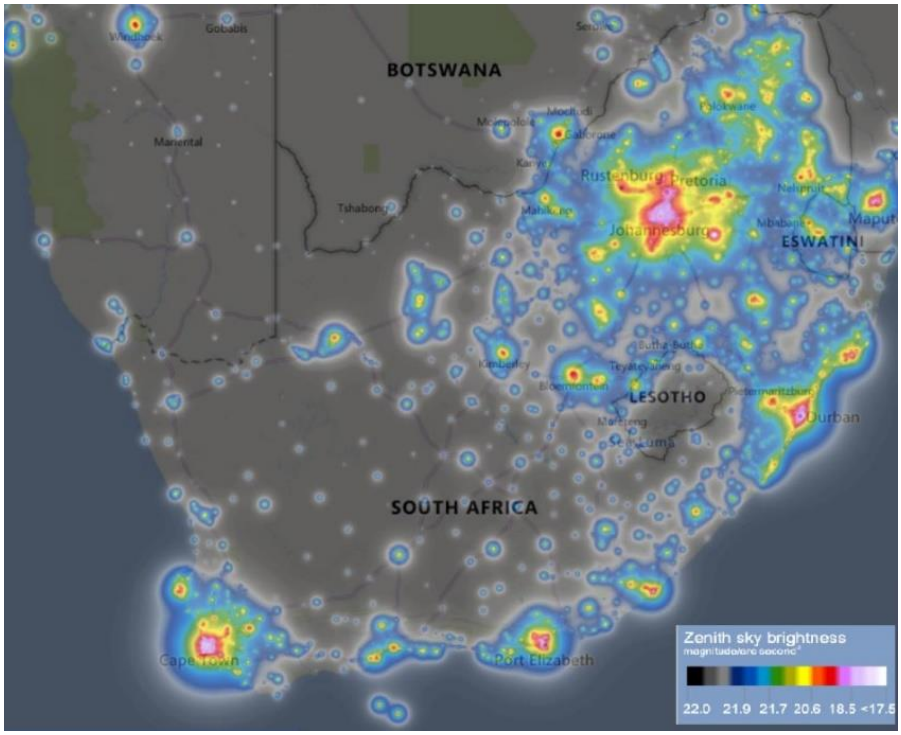

Figure I1: Light pollution map of South Africa (The World Atlas of the Artificial Night Sky Brightness).

APPENDIX J – VISUAL EXPOSURE AND VISIBILITY

Visual exposure refers to the geographic area from which the proposed project will be visible and is defined by the degree of visibility of a proposed project from various receptors sites. Visibility, in turn, is determined by distance between the components of a proposed project and the viewer.

Visual exposure is determined by the zone of visual influence or the "viewshed". A viewshed is the topographically defined area that includes all the major observation sites from where a proposed development will be visible. The boundary of the viewshed tends to connect high points in the landscape through following ridgelines and demarcates the zone of visual influence. The zone of visual influence usually fades out beyond 5km distance and the further away from an observer the project is, the less visible it would be. It is also important to note that the actual zone of visual influence of the proposed project may be smaller than indicated because of screening by existing vegetation and infrastructure, which may partially or totally obscure a view.

General visibility classes, as applicable to the proposed infrastructure are indicated in the table below.

Table J1: Visibility classes (IEMA, 2002).

Class	Description
Highly visible	Clearly noticeable within the observer's view frame within 1km
Moderately visible	Recognisable feature within observer's view frame further than 1km
Marginally visible	Not particularly noticeable within observer's view frame further than 2km
Hardly visible	Practically not visible unless pointed out to observer beyond further than 3km

Three distance zones have been identified (BLM, 1984) based on visibility from travel routes and observation points. These have been determined and confirmed through field verification.

- Foreground – includes local and sub-regional areas visible from main roads, farm houses, residential areas such as towns and villages, industrial/commercial areas and gravel farm roads, and any other viewing locations which are up to 1 kilometre away.
- Middle ground – includes local and sub-regional areas visible from main roads, residential areas such as towns and villages, isolated houses, industrial/commercial areas, accommodation at nature reserves and gravel farm roads, or other viewing locations which are up to 3 kilometres away.
- Background – includes sub-regional areas barely visible further than 3 kilometres away.

Line of Sight Analysis

A line of sight and elevation profile analysis has been conducted through drawing of a graphic line between two points on a surface that shows where along the line the view is obstructed. In Google Earth Pro a series of cross-sections have been evaluated, extending from various points of the project area, towards possible receptor sites. The visibility of each point along the cross section was calculated though the use of the Google Earth Pro Elevation Profile function. Emphasis was placed on confirming whether the proposed development areas will be visible from sensitive receptors in the vicinity. Various cross sections, selected to traverse a variety of receptor sites, were investigated to supplement information provided by the KOP analysis. The function only evaluates the topography of the area with land cover and vegetation not being taken into account. To ensure the line of sight is fully assessed the height of the proposed infrastructure have been incorporated through the use of conceptual block models based on the site layout and the heights provided by the project professional team.

Viewshed Analysis

The viewshed analysis calculates the geographical locations from where the proposed project might be visible. This potential visual exposure of the project has been modelled by creating a Digital Terrain Model (DTM) from 1m contour data, and applying a viewshed analysis using GIS software, whereby all areas with a line of sight towards the proposed project is indicated. It must be noted that the heights of existing infrastructure and vegetation are not included in the calculation of the viewshed and it is, therefore, important to bear in mind that the proposed development will not be visible from all points within the viewshed, as views may be obstructed by visual elements, whereby such intervening objects will modify the viewshed at ground level.

Key Observation Points

Key Observation Points (KOPs) were identified based on prominent viewpoints, where uninterrupted views of the proposed project and related infrastructure is expected to occur and at points where positive viewshed areas intersect with potential receptors. The KOPs were selected within 5km of the proposed project, as visual receptors beyond this distance are unlikely to be significantly affected. The KOP analyses have been conducted by investigating the visual influence of the proposed infrastructure as per the available layout, taking into account that at a distance from the project area, the visibility of the proposed infrastructure will be reduced.

APPENDIX K – INDEMNITY AND TERMS OF USE OF THIS REPORT

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and SAS CC and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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APPENDIX L – SPECIALIST INFORMATION

Details of the specialist who prepared the report

Stephen van Staden MSc Environmental Management (University of Johannesburg)

Sanja Erwee BSc Zoology (University of Pretoria)

The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Stephen van Staden		
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Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
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Qualifications	MSc (Environmental Management) (University of Johannesburg) BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg) BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP) Accredited River Health practitioner by the South African River Health Program (RHP) Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum		

Specialist Declaration

I, Stephen van Staden, declare that -

- I act as the independent specialist in this application;
- 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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

Signature of the Specialist

SAS ENVIRONMENTAL GROUP OF COMPANIES –

SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Group CEO, Water Resource discipline lead, Managing member, Ecologist, Aquatic Ecologist
Joined SAS Environmental Group of Companies	2003 (year of establishment)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
Accredited River Health practitioner by the South African River Health Program (RHP)
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum
Member of the Gauteng Wetland Forum;
Member of International Association of Impact Assessors (IAIA) South Africa;
Member of the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000
Tools for wetland assessment short course Rhodes University	2016
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2013

Short Courses

Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA)	2009
Introduction to Project Management - Online course by the University of Adelaide	2016
Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017

AREAS OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia
Eastern Africa – Tanzania Mauritius
West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona
Central Africa – Democratic Republic of the Congo

SELECTED PROJECT EXAMPLES OUT OF OVER 2000 PROJECTS WORKED ON

1 Mining: Coal, Chrome, PGM's, Mineral Sands, Gold, Phosphate, river sand, clay, fluorspar
2 Linear developments
3 Energy Transmission, telecommunication, pipelines, roads

4 Minerals beneficiation
5 Renewable energy (wind and solar)
6 Commercial development
7 Residential development
8 Agriculture
9 Industrial/chemical

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant species and Landscape Plan
- Freshwater Offset Plan
- Hydropedological Assessment
- Pit Closure Analysis

Aquatic Ecological Assessment and Water Quality Studies

- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans

Soil and Land Capability Assessment

- Soil and Land Capability Assessment
- Soil Monitoring
- Soil Mapping

Visual Impact Assessment

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments
- View Shed Analyses
- Visual Modelling

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions.

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION CURRICULUM VITAE OF SANJA ERWEE

PERSONAL DETAILS

Position in Company	GIS Technician and Visual Specialist
Joined SAS Environmental Group of Companies	2014

EDUCATION

Qualifications

BSC Zoology (University of Pretoria)	2013

Short Courses

Global Mapper	2015
SANBI BGIS Course	2017
Global Mapper Lidar Course	2017
ESRI MOOC ARCGIS Cartography	2018

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Northern Cape, Western Cape Free State

KEY SPECIALIST DISCIPLINES

Freshwater Assessments

- Desktop Freshwater Delineation
- Plant species and Landscape Plan

Visual Impact Assessment

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments
- View Shed Analyses
- Visual Modelling

GIS

- Mapping and GIS for various sectors and various disciplines (biodiversity, freshwater, aquatic, soil and land capability).