

**Development of Lodges, Roads and other Tourist Infrastructure in
Kapama Private Game Reserve, Limpopo Province
Section 24G**

VISUAL IMPACT ASSESSMENT

By:

NuLeaf Planning and Environmental (Pty) Ltd
Office 231, Building 8, CSIR Campus, Meiring Naude Road, Brummeria
Tel: +27 (0)12 753 5792 Fax: +27 (0)86 571 6292
E-mail: peter@nuleafsa.co.za Web: www.nuleafsa.co.za



May 2019

TABLE OF CONTENTS

TABLE OF CONTENTS.....	ii
LIST OF MAPS.....	iii
1 INTRODUCTION.....	4
1.1 QUALIFICATION AND EXPERIENCE OF THE PROFESSIONAL TEAM.....	4
1.2 LEGAL FRAMEWORK.....	4
1.3 INFORMATION BASE.....	4
1.4 ASSUMPTIONS AND LIMITATIONS.....	5
1.5 LEVEL OF CONFIDENCE.....	5
2 METHODOLOGY.....	6
3 PROJECT DESCRIPTION.....	7
4 SCOPE OF WORK.....	9
5 THE AFFECTED ENVIRONMENT.....	9
5.1 GENERAL ENVIRONMENT.....	9
6 RESULTS.....	13
6.1 VISUAL ABSORPTION CAPACITY.....	13
6.2 VISUAL EXPOSURE.....	14
6.3 BEST PRACTICE MITIGATION MEASURES.....	16
7 CONCLUSION AND RECOMMENDATIONS.....	17
8 REFERENCES/DATA SOURCES.....	17

LIST OF MAPS

Map 1: Cumulative visual exposure of the existing development at Kapama Private Game Reserve

LIST OF FIGURES

Figure 1: Various lodge developments within KPGR
Figure 2: Topography of the Reserve and surrounds
Figure 3: Visual quality of the Reserve and the Klasseri River
Figure 4: Visual quality of the Region
Figure 5: High VAC of the receiving environment

LIST OF TABLES

Table 1: Level of Confidence

1 INTRODUCTION

1.1 QUALIFICATION AND EXPERIENCE OF THE PROFESSIONAL TEAM

NuLeaf Planning and Environmental (Pty) Ltd, specialising in Visual Impact Assessment, undertook this visual assessment.

The team undertaking the visual assessment has extensive practical knowledge in spatial analysis, environmental modelling and digital mapping, and applies this knowledge in various scientific fields and disciplines. The expertise of these practitioners is often utilised in Environmental Impact Assessments and Environmental Management Plans.

The visual assessment team is familiar with the "Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes" (Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning) and utilises the principles and recommendations stated therein to undertake visual impact assessments. Although the guidelines have been developed with specific reference to the Western Cape Province of South Africa, the core elements are more widely applicable.

NuLeaf Planning and Environmental have been appointed as an independent specialist consultant to undertake the visual impact assessment. Neither the author, nor NuLeaf Planning and Environmental will benefit from the outcome of the project decision-making.

1.2 LEGAL FRAMEWORK

The following legislation and guidelines have been considered in the preparation of this report:

- The Environmental Impact Assessment Amendment Regulations, 2010;
- Guideline on Generic Terms of Reference for EAPs and Project Schedules (DEADP, Provincial Government of the Western Cape, 2011).
- Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP, Provincial Government of the Western Cape, 2005).

1.3 INFORMATION BASE

This assessment was based on information from the following sources:

- Topographical maps and GIS generated data were sourced from the Surveyor General, Surveys and Mapping in Mowbray, Cape Town;
- Observations made and photographs taken during site visits;
- Conceptual layout plan;
- Professional judgement based on experience gained from similar projects; and
- Literature research on similar projects.

1.4 ASSUMPTIONS AND LIMITATIONS

This assessment was undertaken during the operational stage of the project and is based on information available at that time.

During the period of 1989-2018, the Applicant, Kapama Game Reserve (Pty) LTD, carried out activities listed under the various EIA Regulations. All of these developments were constructed without the necessary environmental authorization and the Applicant is now applying for ex post facto approval.

This Visual Impact Assessment and all associated mapping for the developments has been undertaken according to the worst case scenario typical to that specific site. For Bosplaas and River Lodge the visual exposure was mapped for a typical 3-storey building with roof (measuring approximately 9m), Southern Camp, Buffalo Camp and Drankensig Staff have been mapped for a typical 2-storey building with a roof (measuring approximately 6m), while Karula, the Reservoirs, Hongonyi Gate and Main Gate have been mapped for a typical 1-storey building with a roof (measuring approximately 3m).

As the support infrastructure (i.e. roads, parking, bulk services, airstrip, etc.) has no vertical dimension (i.e. it is located at ground level), no viewshed maps have been generated for these. It is assumed that this ground-level infrastructure will not be visible beyond the boundaries of the site.

Eskom pylons are present on the Reserve, however, this infrastructure is not dealt with in this assessment as it falls out of the scope of the development.

1.5 LEVEL OF CONFIDENCE

Level of confidence¹ is determined as a function of:

- The information available, and understanding of the study area by the practitioner:
 - **3:** A high level of information is available of the study area and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.
 - **2:** A moderate level of information is available of the study area and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.
 - **1:** Limited information is available of the study area and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.
- The information available, understanding of the project and experience of this type of project by the practitioner:
 - **3:** A high level of information and knowledge is available of the project and the visual impact assessor is well experienced in this type of project and level of assessment.
 - **2:** A moderate level of information and knowledge is available of the project and the visual impact assessor is moderately experienced in this type of project and level of assessment.

¹ Adapted from Oberholzer (2005).

- **1:** Limited information and knowledge is available of the project and the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

Table 2: Level of Confidence

	Information on the project & experience of the practitioner			
Information on the study area		3	2	1
	3	9	6	3
	2	6	4	2
	1	3	2	1

*The level of confidence for this assessment is determined to be **9** and indicates that the author's confidence in the accuracy of the findings is high:*

- The information available, and understanding of the study area by the practitioner is rated as **3**
- The information available, understanding and experience of this type of project by the practitioner is rated as **3**.

2 METHODOLOGY

The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed development. A detailed Digital Terrain Model (DTM) for the study area was created from 5m interval contours from the National Geo-spatial Information data supplied by the Department: Rural Development and Land Reform.

The approach utilised to identify potential issues related to the visual impact included the following activities:

- The creation of a detailed digital terrain model (DTM) of the potentially affected environment;
- The sourcing of relevant spatial data to develop an understanding of the existing visual character and quality of the receiving environment. This includes cadastral features, vegetation types, land use activities, topographical features, site placement, etc.;
- The identification of sensitive environments upon which the proposed development could have a potential visual impact;
- The creation of viewshed analyses from the proposed development area in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analyses take into account the dimensions of the proposed structures.

This report (Visual Impact Assessment) sets out to identify and quantify the visual impacts of the Lodges, Roads and other Tourist Infrastructure in Kapama Private Game Reserve.

The following methodology has been followed for the assessment of visual impact²:

- **Determine potential visual exposure**

The visibility or visual exposure of any development is the point of departure for the visual impact assessment. It stands to reason that if the proposed development were not visible, no impact would occur.

Viewshed analyses of the proposed development components indicate the potential visibility.

- **Determine the visual absorption capacity**

This is the capacity of the receiving environment to absorb the potential visual impact of the developments and infrastructure. The VAC is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC.

The VAC would also be high where the environment can readily absorb the structure in terms of texture, colour, form and light / shade characteristics of the structure. On the other hand, the VAC for a structure contrasting markedly with one or more of the characteristics of the environment would be low.

The VAC also generally increases with distance, where discernible detail in visual characteristics of both environment and structure decreases.

The digital terrain model utilised in the calculation of the visual exposure of the development does not incorporate the potential visual absorption capacity (VAC) of the natural vegetation of the region. It is therefore necessary to determine the VAC by means of the interpretation of the vegetation cover and other landscape characteristics.

- **Determine impact significance**

The potential visual impacts identified and described are quantified in their respective geographical locations in order to determine the significance of the anticipated impact. Significance is determined as a function of extent, duration, magnitude and probability. Appropriate mitigation is recommended where relevant.

3 PROJECT DESCRIPTION

During the period of 1989-2018, the Applicant, Kapama Game Reserve (Pty) LTD, carried out activities listed under the various EIA Regulations. All of these developments were constructed without the necessary environmental authorization and the Applicant is now applying for *ex post facto* approval.

Kapama Private Game Reserve (KPGR) has developed several commercial lodges throughout the Reserve, as well as, staff accommodation and other management infrastructure. The various properties affected are inclusive of the following:

² This methodology is adapted from that developed by MetroGIS, and detailed in numerous Visual Impact Assessments undertaken by them (2010-2014).

Remaining extent of the farm Hoedspruit 82 KU, Portion 228 of the farm Guernsey 81 KU, Remaining extent of Portion 4 of the farm Moria 83 KU, Portion 213 (ptn of Ptn 194) of the Farm Guernsey 81KU, Remaining extent of Portion 3 of the farm Moria 81 KU, Portion 229 Of Guernsey, 81/KU, Remaining extent of Portion 204 of the farm Guernsey 81 KU.

The developments consist of the following:

- River Lodge:
 - Sleeps 164 guests and 40 staff
 - Reception area and curio shop
 - lounge, bars and swimming pools
 - dining areas
 - spa
 - vehicle parking (guest and game drive vehicles)
 - brick walkways
 - sewage treatment facility
- Buffalo Camp
 - Sleeps 20 guests in canvas tents on elevated platforms and 8 staff
 - Reception area
 - lounge, bar and swimming pool
 - dining area
 - vehicle parking
 - elevated wooden walkways
 - sewage treatment facility
- Southern Camp
 - Sleeps 56 guests and 40 staff
 - Reception area and curio shop
 - lounge, bar and swimming pools
 - dining area
 - vehicle parking (guest and game drive vehicles)
 - brick walkways
 - sewage treatment facility
- Karula
 - Sleeps 28 guests and 40 staff
 - Reception area and curio shop
 - lounge, bar, library and swimming pool
 - dining area
 - spa and wellness center
 - vehicle parking
 - walkways
 - sewage treatment facility
- Drakensig Staff Village
 - Sleeps 60 staff
 - Workshop
- Karula Staff Residence
 - Sleeps 20
- Bosplaas
 - Private residence sleeping 8 guests and staff
- Hongonyi Gate
- Main entrance Gate on R40
- Airstrip
- Reservoirs
- River crossings
- Access roads and game drives roads



Figure 1: Various lodge developments within KPGR

4 SCOPE OF WORK

The scope of work for this assessment includes the determination of the potential visual impacts in terms of nature, extent, duration, magnitude, probability and significance of the operation of the Lodges, Roads and other Tourist Infrastructure in Kapama Private Game Reserve. Mitigation measures are recommended where appropriate.

As the affected property is located within the Kapama Private Game Reserve, special consideration has been taken to determine what the extent of the visual impact will be on such a sensitive area.

5 THE AFFECTED ENVIRONMENT

5.1 GENERAL ENVIRONMENT

The affected properties are all situated within Kapama Private Game Reserve in Maruleng Local Municipality, approximately 10 Km south of Hoedspruit. The Kapama Private Game Reserve is approximately 15 000 ha in size.

The topography of the general area is flat to undulating with shallowly incised drainage lines. Most of the study area contains untransformed vegetation, but existing infrastructure is present within the KPGR.



Figure 2: Topography of the Reserve and surrounds

According to the current National Vegetation Map (SANBI, 2018), the vegetation type present within the study area is Granite Lowveld, of which 21% has been transformed, mostly through agriculture and urbanisation. Mucina & Rutherford (2006) assessed this community to be Vulnerable, but it is not situated within any Threatened Ecosystems as listed in Government Gazette No. 34809 of 9 December 2011 (DEAT, 2011). Typical Granite Lowveld is dominated by tall trees such as *Acacia nigrescens* and *Sclerocarya birrea*, as well as a variety of smaller trees and shrubs such as *Combretum zeyheri* and *C. apiculatum*, *Terminalia sericea*, *Euclea divinorum* and *Peltophorum africanum*.

Hoedspruit normally receives about 410 mm of rain per year, with most rainfall occurring mainly during mid-summer. The region receives the lowest rainfall (0 mm) in July and the highest (84 mm) in December. The monthly distribution of average daily maximum temperatures indicates that the average midday temperatures for Hoedspruit range from 23.3°C in June to 30.2°C in January. The overall mean annual rainfall is approximately 500 mm per annum.

The surrounding area is mainly used for conservation and tourism related activities, the area being characterised by game farms beside for the Eastgate Airport located north of the KPGR. The sites are situated within the Kapama Private Game Reserve. KPGR consists of various properties including Lenro and Miala Beleggings on the eastern boundary, Jebero and Mbezi Beleggings on the southern boundary and the Moditio Nature Reserve along the western boundary. The Kapama Nature Reserve is included in the Kruger-to-Canyon Biosphere Reserve (River Lodge Scoping Report, 2005).

In general, the landscape character of the greater study area presents as rural and natural, with some agriculture. The sites themselves are natural in character

and furthermore is situated within a conservation zone of the surrounding reserve. Surrounding tourist attractions within the region include the Kruger National Park, Timbavati, Kiaserie, Sabi Sand, Thornybush, Kapama, Makalali and The Blyde Nature Reserve representing a 'community' of protected areas. The private nature reserves in the Central Lowveld region make up the largest privately owned nature reserve complex in the world, approximately 500,000 hectares in extent which includes the escarpment protected areas (River Lodge Scoping Report, 2005).

The majority of the study area is sparsely populated, with the highest concentration of people living in the town of Hoedspruit. Eastgate Airport (previously the Hoedspruit Airforce Base) is located directly adjacent to KPGR along the northern boundary. Settlements, where they occur, are usually rural homesteads / farmsteads or other lodges. A few homesteads are located within the KPGR. These are mainly home to staff and Reserve Management. A fair number of farmsteads/homesteads are located just outside of the Reserve on the neighbouring properties, particularly in the south east.

It is uncertain whether all of the potentially affected farmsteads are inhabited or not. It stands to reason that farmsteads that are not currently inhabited will not be visually impacted upon at present. These farmsteads do, however retain the potential to be affected visually should they ever become inhabited again in the future. For this reason, the author of this document operates under the assumption that they are all inhabited.

The visual quality of the receiving environment within the study areas is high, by virtue of the vast and predominately undeveloped nature of the environment. This lends a distinct sense of place to the area. This area is known as a tourist destination in its own right and owing to its location in its adjacency to the Greater Kruger National Park and other game reserves within the region.



Figure 3: Visual quality of the Reserve and the Klasseri River



Figure 4: Visual quality of the Region

6 RESULTS

6.1 VISUAL ABSORPTION CAPACITY

Visual Absorption Capacity (VAC) is the capacity of the receiving environment to absorb the potential visual impact of the existing development. VAC is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC.

The VAC would also be high where the environment can readily absorb the development in terms of texture, colour, form and light / shade characteristics of the structure. On the other hand, the VAC for a development contrasting markedly with one or more of the characteristics of the environment would be low.

The VAC also generally increases with distance, where discernable detail in visual characteristics of both environment and development decreases.

Overall, the Visual Absorption Capacity (VAC) of the site and surrounds is high due to the nature of the vegetation (i.e. thicket and woodland).

VAC will be taken into account within the Reserve in the Assessment of Visual Impacts to follow owing not only to the fact that the vegetation lends itself to a high VAC but also as a result of visual impact having already taken place.



Figure 5: High VAC of the receiving environment

6.2 VISUAL EXPOSURE

The results of viewshed analysis and potential observer proximity for the developments are shown on **Map 1** to follow.

A visibility analysis for the developments was generated from all of the developed sites on Kapama at an offset of 9 m above average ground level, which is almost the height of an average 3 storey building for Bosplaas and River Lodge. Southern Camp, Buffalo Camp and Drakensig Staff generated at an offset of 6 m above average ground level, which is almost the height of an average 2-storey building, while Karula, the Reservoirs, Hongonyi Gate and Main Gate have been mapped for a typical 1-storey building with a roof, measuring approximately 3m. The receptor height within the receiving environment was set at 2m above average ground level, which is representative of a person standing upright.

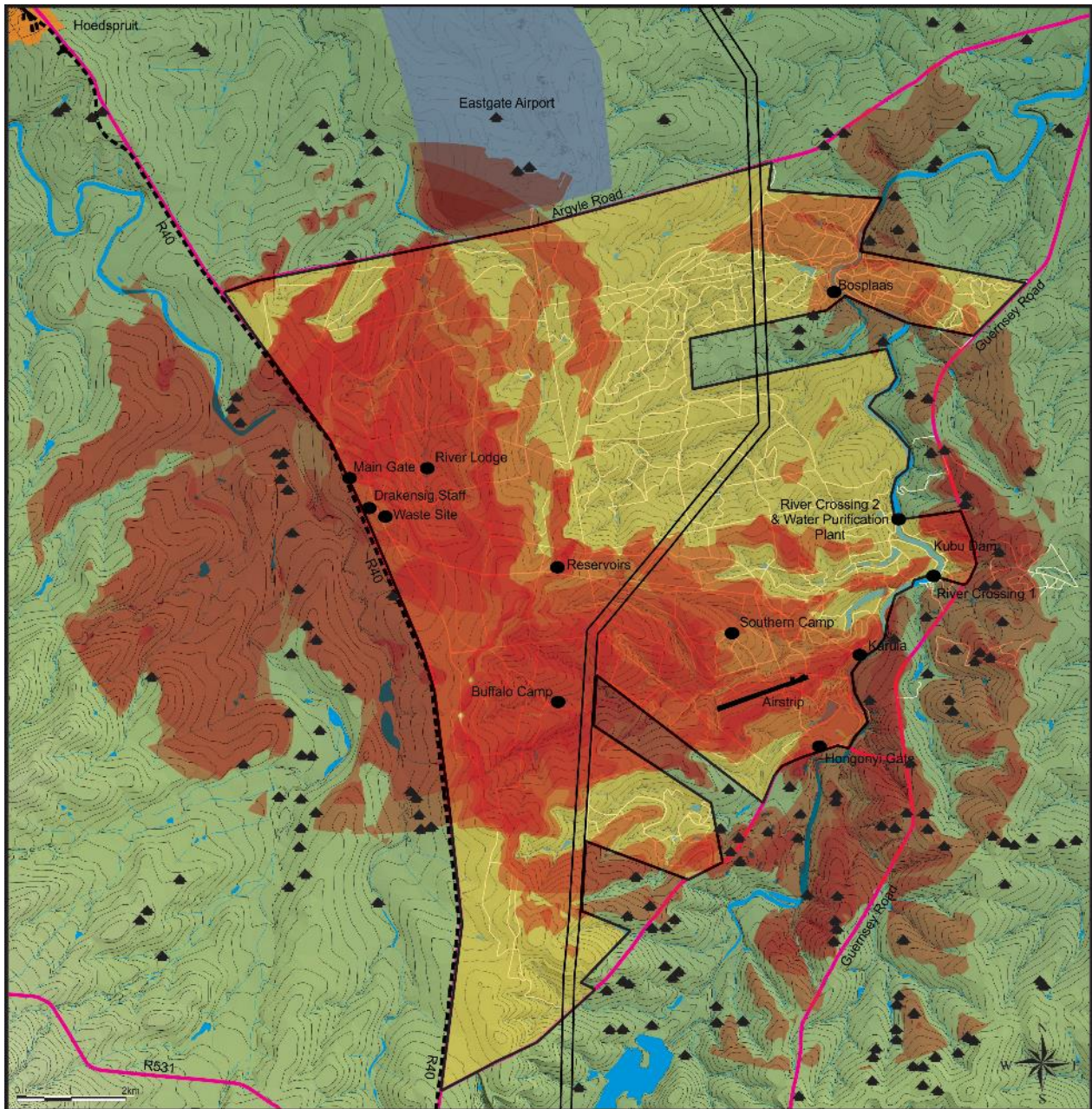
This was done in order to determine the general visual exposure of the area under investigation, simulating the maximum heights of buildings associated with the existing development in order to determine the developments current visual impact.

Proximity radii for the developed sites was created in order to indicate the scale and viewing distance of the development and to determine the prominence of the structures in relation to their environment. The proximity radii are based on the anticipated visual experience of the observer over 6km distances. The analysis does not include the potential shielding effect (i.e. VAC) of the existing environment, and does not take into consideration the limitations of the human eye, therefore signifying a worst-case scenario.

For the purpose of this study, a combined viewshed analysis was generated for all of the developed sites and management infrastructure. The findings of the various generated viewsheds are detailed below. The cumulative potential visual exposure for the developed sites on KPGR and management infrastructure is as follows:

- The visual exposure is predominately concentrated within the Reserve itself. Areas of high visual exposure are noted in and around the area surrounding River Lodge, Main Gate and Drakensig. The area between Buffalo Camp and the Airstrip are also similarly affected. These affected areas indicated that a visual receptor is likely to be able to see 3 or more other developed sites.
- The visual exposure outside of the Reserve is located in predominantly in certain areas to the west and east of the Reserve, adjacent to the Reserves boundary. These areas will experience low to moderate visual exposure with one to two developed sites being visible. Sensitive visual receptors that may be affected are farmsteads and other lodges, both local and neighbouring. It should be noted that there is already an existing visual impact in these areas owing to the fact that the construction of these buildings has already taken place and have been in operation for many years.

Since this visual impact has already taken place it is expected any sensitive visual receptors in the area are expecting or accustomed to the impact. This, together with the inclusion of the High VAC of the surrounding area, has resulted in the a negligible visual impact considered for areas outside of the Reserve and low for the areas within the Reserve.



KAPAMA PRIVATE GAME RESERVE - VISUAL EXPOSURE MAP

Legend

- Non perennial Rivers
- Perennial Rivers
- Dams
- Major Roads
- Railway Line
- Powerline
- Kapama Private Game Reserve
- Sites
- Internal Roads
- 5m Contours

- VISUAL EXPOSURE**
- Range rings, 5km radius
 - High exposure (3 or more sites visible)
 - Moderate (2 sites visible)
 - Low (1 site visible)
 - No sites visible

This map illustrates the visual exposure footprint of all the sites; calculated using a digital terrain model, developed using 5m contours. The exposure footprint is measured over a 6km radius using a receiver height of 2m and a transmitter height of 3m for Karula, the Reservoirs, Hongonyi Gate and Main Gate, 6m for Southern Camp, Buffalo Camp and Drakensig, and 9m for Bosplaas and River Lodge.



Map 1: Cumulative visual exposure of the existing development at Kapama Private Game Reserve

6.3 BEST PRACTICE MITIGATION MEASURES

The following best practice mitigation measures will further contribute to reducing the magnitude of the visual impacts discussed in this report:

- Some mitigation of primary and secondary impacts may be achieved by ensuring that the preservation and / or re-introduction of vegetation be allowed for. These measure will help to soften the appearance of the facility within its context. Such mitigation includes the following:
 - Retain / re-establish and maintain large trees, natural features and noteworthy natural vegetation in all areas outside of the development footprint.
 - Retain natural pockets (wetland, river and other sensitive vegetation zones) as buffers within the development and along the perimeter.
 - Retain vegetation in all areas outside of actual built footprints wherever possible.
 - Soften hard spaces and parking areas through the retention of existing vegetation or the introduction of appropriate indigenous planting.
 - Make use of muted earth tones, matt surfaces and natural materials rather than primary colours, reflective surfaces and high-tech finishes for all buildings, structures and infrastructure.
 - Tilt large window areas to negate reflection impact.
 - Limit the overall height of all buildings to a maximum of 6m.
 - Avoid large areas of un-shaded reflective and hard paving surface.
 - Avoid the placement of unsightly services and infrastructure in visually prominent areas.
 - Appropriately screen service areas.
 - Manufacture PV panels with an Anti-Reflective Coating (ARC).
- Mitigation of other lighting impacts includes the pro-active design, planning and specification lighting for the development. The correct specification and placement of lighting and light fixtures will go far to contain rather than spread the light. Additional measures include the following:
 - Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);
 - Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
 - Making use of minimum lumen or wattage in fixtures;
 - Making use of down-lighters, or shielded fixtures;
 - Making use of Low Pressure Sodium lighting or other types of low impact lighting.
 - Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.
- The maintenance of the buildings and infrastructure is critical, and will ensure that the development does not degrade or become an eyesore.

These mitigation measures should be implemented and maintained on an on-going basis.

7 CONCLUSION AND RECOMMENDATIONS

The operation of the various developed sites within KPGR has a low to negligible visual impact on the scenic resources of the study area. The implementation of the best practice mitigation measures are recommended and will go far in reducing the magnitude of visual impacts discussed by softening the appearance of the development within its context. The recommendations made should be followed and implemented on an ongoing basis.

Considering all factors, it is concluded that the development is appropriate within its context from a visual perspective, and that the experienced visual impacts are neither unacceptable in nature nor excessive in magnitude. The resultant visual impacts are therefore not considered to be a fatal flaw for this type of development.

Since this visual impact has already taken place it is expected any sensitive visual receptors in the area are expecting or are already accustomed to the impact. The relatively limited extent of visual receptors in the area and the high to VAC of the area is a strong consideration in this regard. The visual impact is considered negligible for areas outside of the Reserve and low for the areas within the Reserve.

The author has no objection to the application for authorisation under Section 24G in respects to the visual impact, subject to the implementation of the best practice mitigation measures recommended.

8 REFERENCES/DATA SOURCES

Chief Director of Surveys and Mapping, varying dates. *1:50 000 Topo-cadastral maps and digital data.*

CSIR/ARC, 2000. *National Land-cover Database 2000 (NLC 2000).*

DEADP, Provincial Government of the Western Cape, 2011. *Guideline on Generic Terms of Reference for EAPS and Project Schedules.*

Department of Environmental Affairs and Tourism (DEA&T), 2001. *Environmental Potential Atlas (ENPAT) for the Gauteng Province.*

National Botanical Institute (NBI), 2004. *Vegetation Map of South Africa, Lesotho and Swaziland (Unpublished Beta Version 3.0).*

Oberholzer, B. (2005). *Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1.*

The Environmental Impact Assessment Amendment Regulations. In Government Gazette Nr 33306, 18 June 2010.