PROPOSED DEVELOPMENT OF A 1ML RESERVOIR AT THE BAKUBUNG LODGE, PILANESBERG NATIONAL PARK, NORTH WEST PROVINCE

VISUAL SCREENING

For Pilanesberg Resorts (Pty) Ltd

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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.

Pilanesberg Resorts (Pty) Ltd, appointed NuLeaf Planning and Environmental 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 planning stage of the project and is based on information available at that time.

This Visual Impact Assessment and all associated mapping for the proposed development has been undertaken according to the worst case scenario, which is a typical 1Ml reservoir (measuring approximately 3m in height).

1.5 LEVEL OF CONFIDENCE

Level of confidence[1] 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**: 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:*

[1] Adapted from Oberholzer (2005).

- The information available, and understanding of the study area by the practitioner is rated as **3** and
- 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 10m 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 screening) sets out to identify and quantify the possible visual impacts related to the proposed Bakubung Reservoir, as well as, offer potential mitigation measures, where required.

The following methodology has been followed for the assessment of visual impact[2]:

- **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 visual distance and observer proximity to the development**

  In order to refine the visual exposure of the development on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence.

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

Proximity radii are created in order to indicate the scale and viewing distance of the development and to determine the prominence thereof in relation to the environment.

The visual distance theory and the observer's proximity to the development are closely related, and especially relevant, when considered from areas with a high viewer incidence and a predominantly negative visual perception of the proposed development.

- **Determine viewer incidence, perception and sensitivity**

  The number of observers and their perception of a development determine the concept of visual impact. If there are no observers, then there would be no visual impact. If the visual perception of a development is favourable to all observers, then the visual impact would be positive.

  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 proposed development and its related infrastructure.

  It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer; regularity of sighting, cultural background, state of mind, and purpose of sighting which would create a myriad of options.

- **Determine the visual absorption capacity**

  This is the capacity of the receiving environment to absorb the potential visual impact of the proposed development. 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 the visual impact index**

  The results of the above analyses are merged in order to determine where the areas of likely visual impact would occur. These areas are further analysed in terms of the previously mentioned issues (related to the visual impact) and in order to judge the magnitude of each impact.

- **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

Pilanesberg Resorts is proposing the construction of a new 1 Ml (1000 m^3) potable water storage reservoir to replace the various existing, aging and leaking potable water storage reservoirs at Bakubung Lodge, in the Pilanesberg National Park. Refer to **Map 1**.

As part of the proposed development the existing electric fence will need to be extended to include the proposed site within the Bakubung Lodge boundary. This will allow for safe access to the Reservoir by the lodges maintenance staff, as well as, ensure the reservoir isn't damaged by wildlife such as elephant in search of water.

The total development footprint will not exceed one (1) hectare.

The 266 Ha affected properties is located in the Pilanesberg National Park within the Moses Kotane Local Municipality.

4 THE AFFECTED ENVIRONMENT

4.1 GENERAL ENVIRONMENT

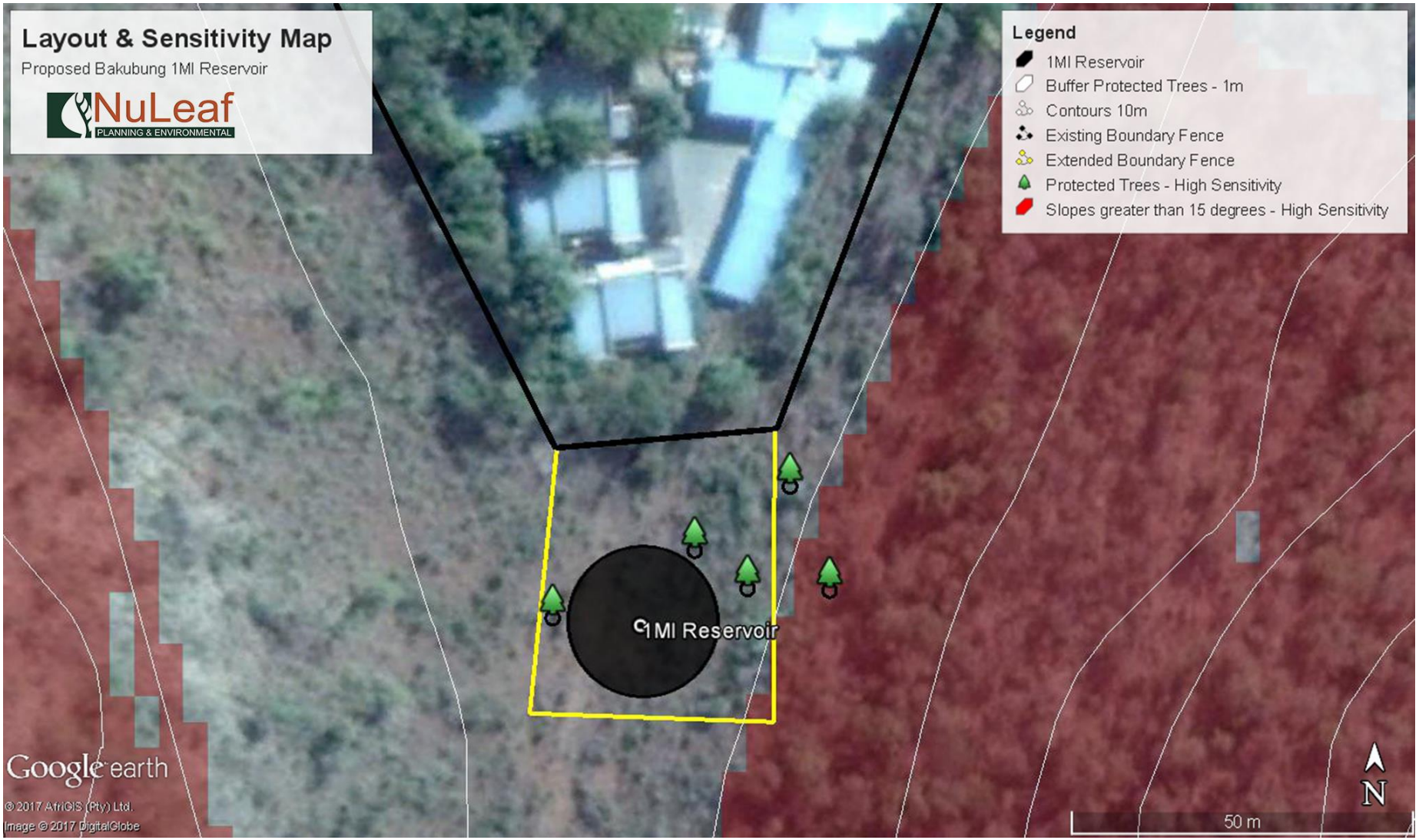
The site for the proposed Bakubung Reservoir is located in Bakubung Lodge within the Pilanesberg National Park.

The topography of the study area is closely associated with the rocky hills encircling the ancient volcanic caldera that dominates Pilanesberg. However, the area where the Reservoir will be located is generally flat. Prominent hills are located south and south east of the site. Refer to **Map 2**.

The study area is located within the Central Bushveld Bioregion of the *Savanna* biome within the summer rainfall region with a mid-summer (January) seasonality. The overall mean annual rainfall is approximately 500 mm per annum. The vegetation type is classified as *Pilanesberg Mountain Bushveld* [3].

Land use within the study area is predominately conservation associated with Pilanesberg National Park. Land cover comprises of fairly dense, broad-leaved, deciduous woodland on hillslopes, with more open woodland or savannah on hilltops and valley floors.

[3] Environmental Potential Atlas (ENPAT), 2001.



Map 1: Proposed layout

Figure 1: Topography of the site and surrounds

The majority of the study area is sparsely populated, with the highest concentration of people living in the town of Vaalwater (not situated within the study area). The study area consists of a landscape that can be described as remote due to its considerable distance from any major metropolitan centres or populated areas. Settlements, where they occur, are usually rural homesteads and farmsteads. Refer to **Map 2**.

4.2 VISUAL QUALITY

The visual quality of the region is generally high with large tracts of intact natural vegetation characterising most of the visual environment. There is no evidence of widespread erosion or natural degradation, and development, where this occurs, is domestic in scale located on the outskirts of the Pilanesberg National Park or consists of low impact lodge developments.

Figure 2: Visual quality of the region (Pilanesberg National Park)

The entire study area is considered highly sensitive to visual impacts due to its topography and generally low level of transformation; however, within the bounds of Bakubung Lodge a visual impact has already occurred.

Map 2: Locality (indicating the location of the proposed development and the topography) of the broader study area

5 ANTICIPATED ISSUES RELATED TO VISUAL IMPACT

Anticipated issues related to the potential visual impact of the proposed Bakubung Reservoir include the following:

- The visibility of the development to, and potential visual impact on sensitive visual receptors in close proxmitity to the proposed developement.
- Potential visual impact on sensitive visual receptors within the region.
- The visibility of the proposed development to, and potential visual impact on protected and conservation areas (i.e.Pilanesberg National Park) within the study area.
- The potential visual impact associated with the construction phase of the development on sensitive visual receptors in close proximity.
- The potential visual impact of the development on the visual character of the landscape and sense of place of the region.
- The potential to mitigate visual impacts and inform the design phase.

6 RESULTS

6.1 VISUAL DISTANCE AND OBSERVER PROXIMITY

NuLeaf Planning and Environmental determined proximity offsets based on the anticipated visual experience of the observer over varying distances. In general, the severity of the visual impact on visual receptors decreases with increased distance from the proposed development.

Therefore, in order to refine the visual exposure of the development on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence for the proposed development.

Proximity radii for the proposed development site are 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 varying distances. The distances are adjusted upwards for larger facilities and downwards for smaller facilities (i.e. depending on the size and nature of the proposed development).

Typically, the proximity radii, calculated from the boundary of the property, would be as follows for the proposed Bakubung Reservoir:

- 0 – 0.5 km - Short distance views where the development would be easily and comfortably visible and recognisable.
- 0.5 – 1 km - Medium distance view where the development would become part of the visual environment, but could still be visible and recognisable.
- 1 – 1.5 km - Long distance view where the development might be visible, although this is unlikely.

Tourists and residential receptors in natural and rural contexts are more sensitive than those in urban contexts, due to the absence of visual clutter in these undeveloped and undisturbed areas.

No specific report can be made on viewer perception regarding this proposed development, as no reported stakeholder feedback has been received as of yet. The project does not appear to be controversial, however, and to the knowledge of the author, there are no action groups or individuals opposing the development.

6.2 POTENTIAL VISUAL EXPOSURE

The results of the viewshed analysis and potential observer proximity for the proposed Bakubung Reservoir is shown on **Map 3** that follows.

A visibility analysis for the proposed development was generated from the centre if the reservoir on site at an offset of 3 m above average ground level, which is the height of an average1 Ml reservoir. The receptor height within the receiving environment was set at 1.8m 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 expected height.

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.

The potential visual exposure for the proposed Bakubung Reservoir development is as follows, (Refer to **Map 3**):

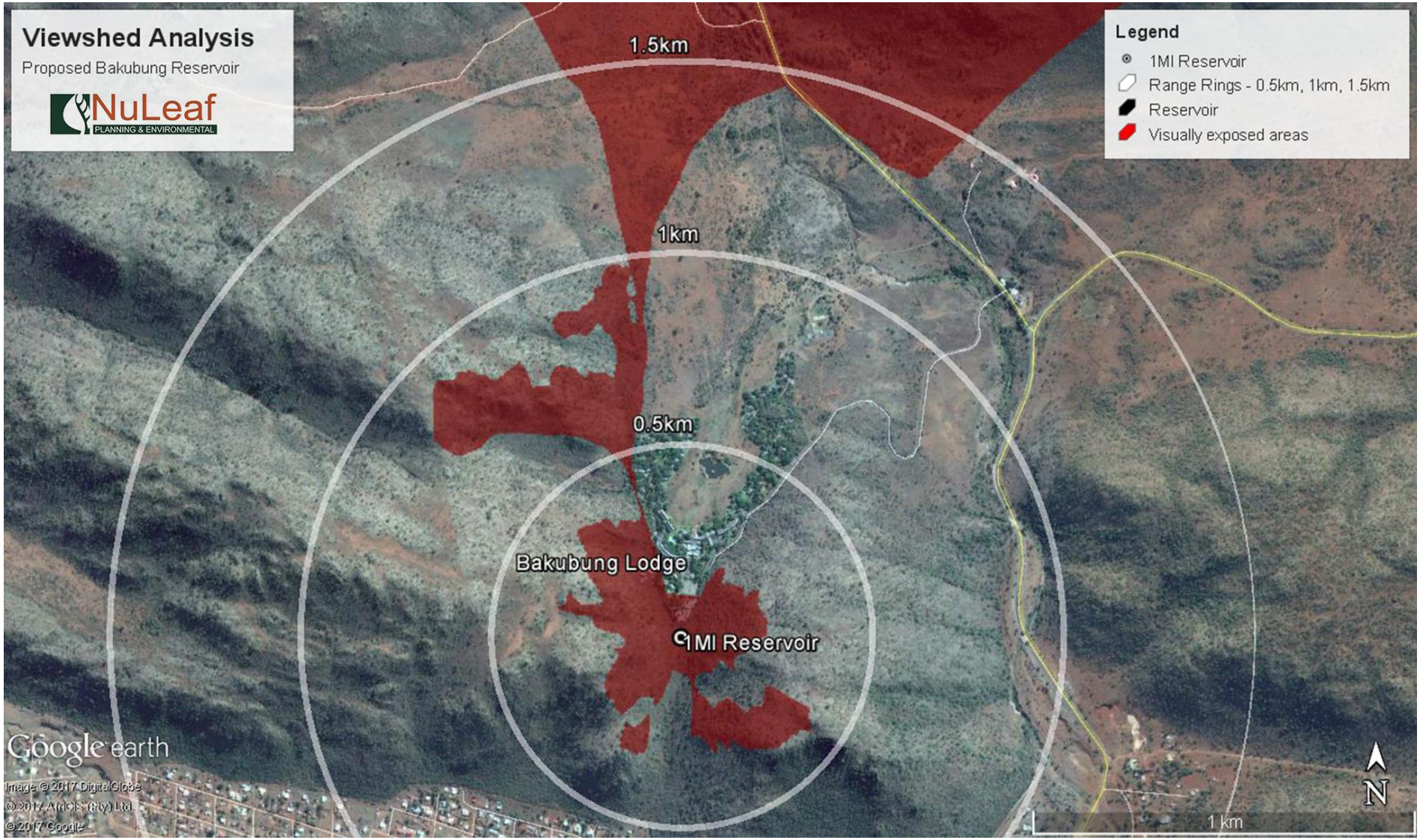
- Potential visual exposure is concentrated on the site itself.

- Potential visual exposure within 0.5km from the site is high, reducing somewhat between 0.5km and 1km from the site. Within this zone, visually exposed areas lie mainly in the hills to the south and north west of Bakubung Lodge. Sensitive visual receptors that may be affected include guest at Bakubung Lodge.

- Between 1km and 1.5km from the site, potential visual exposure decreases markedly in extent, with visually exposed areas lying to the north and north east of Bakubung Lodge in the Pilanesberg National Park. Only sensitive visual receptors within this zone are tourists using the main tar road leading into Pilanesberg National Park.

Figure 3: Panoramic of the site (North to South East)

Figure 4: Panoramic of the site (South to North West)



Map 3: Potential visual exposure of the proposed Bakubung Reservoir

6.3 VISUAL ABSORPTION CAPACITY

Visual Absorption Capacity (VAC) is the capacity of the receiving environment to absorb the potential visual impact of the proposed 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 to moderate, depending on the nature of the vegetation (i.e. natural grassland vegetation will have a low VAC and thicket and woodland would have a moderate VAC).

VAC will be taken into account within the Reserve in the Assessment of Visual Impacts to follow.

Figure 5: High to moderate VAC of the receiving environment

6.4 VISUAL IMPACT INDEX

The combined results of the visual exposure, viewer incidence / perception and visual distance of the proposed LWS development Sites are displayed on **Map 4**. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index.

Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index. An area with short distance, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact when evaluating the issues related to the visual impact.

The visual impact index for the proposed development is further described as follows.

- The visual impact index map indicates a core zone of likely **high** visual impact on the site itself and within 0.5km of the proposed development, due to VAC.

  Sensitive visual receptors within this zone comprise mainly of guests of the Bakubung Lodge. These receptors are likely to experience **moderate** visual impact, however, since the proposed reservoir is located behind the service yard and staff quarters of the lodge this impact is unlikely.

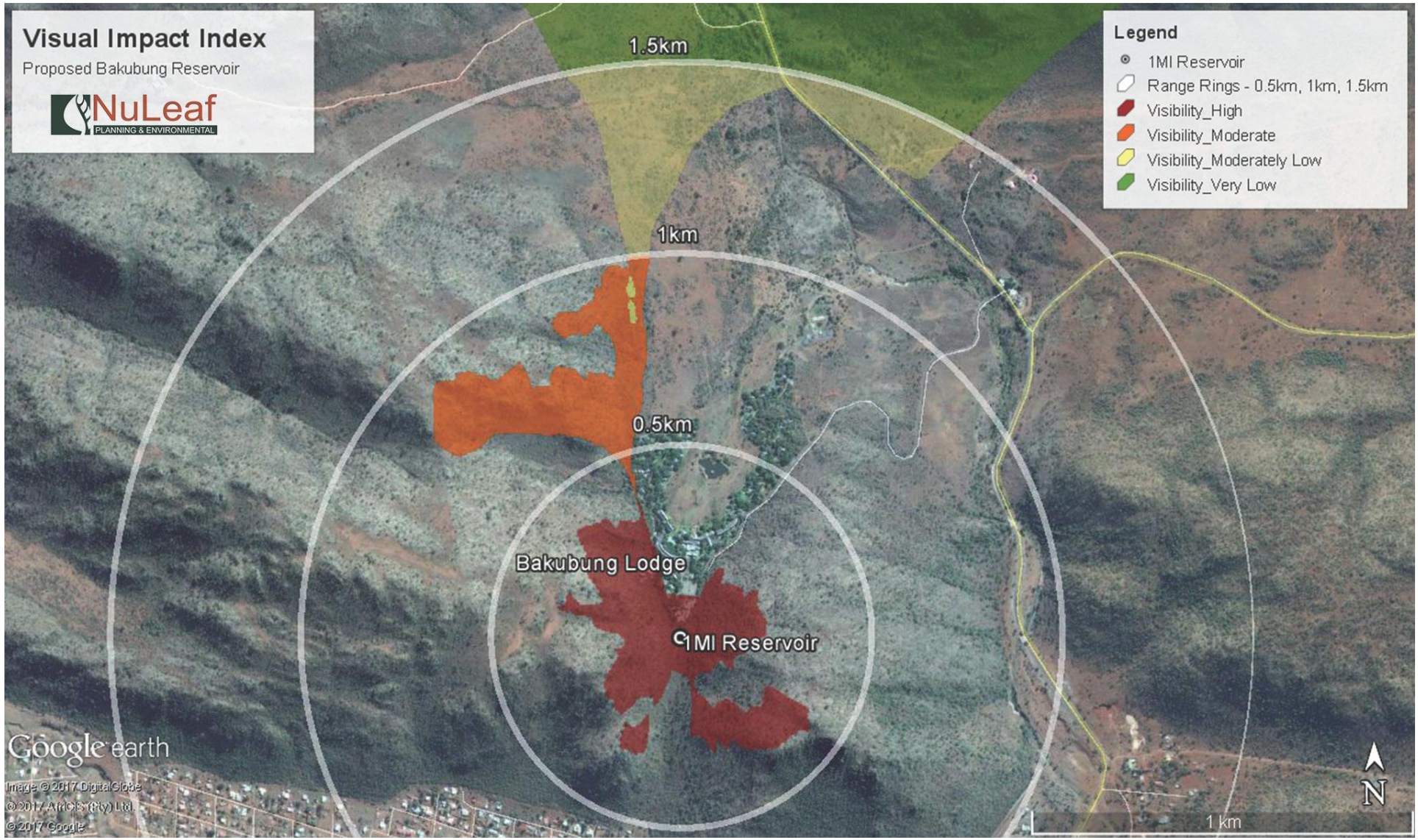
- Visual impact is likely to be **moderate** between 0.5km and 1km of the proposed development.

  No sensitive visual receptors seem to be located in this zone. However, if receptors amy occur in this zone they are likely to experience **moderately low** visual impact.

- Between 1km and 1.5km of the proposed development, the extent of potential visual impact is significantly reduced. Where they occur, visual impacts within this zone due to VAC are likely to be **moderately low**.

  Sensitive visual receptors at this distance include only tourists using the main tar road in Pilanesberg National Park. Visual impacts on these sensitive receptors are likely to be **very low.**

- Remaining impacts beyond 1.5km of the proposed development are expected to be **negligable** where these occur at all.



Map 4: Visual Impact Index

6.5 THE POTENTIAL TO MITIGATE VISUAL IMPACTS

The primary visual impact, namely the presence of the proposed Bakubung Reservoir, may be mitigated from a visual perspective, due to the nature of the development (i.e. development footprint and height). This mitigation potential is further supported by the nature of the receiving environment.

The following mitigation will further contribute to reducing the magnitude of the visual impacts:

- Some mitigation of primary and secondary impacts may be achieved by ensuring that the preservation and / or re-introduction of vegetation be allowed for in the planning and implementation of the development. This measure will help to soften the appearance of the facility within its context. Such mitigation includes the following:

    - Respond to the natural environment during the planning of the Reservoir.
    - Retain / re-establish and maintain large trees, natural features and noteworthy natural vegetation in all areas outside of the development footprint. Adapt the development footprint to accommodate these where necessary.
    - 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 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 structures.
    - Limit the overall height of all structures to a maximum of 3m.
    - 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.

- Mitigation of visual impacts associated with the construction phase, albeit temporary, entails proper planning, management and rehabilitation of all construction sites. Construction should be managed according to the following principles:

    - Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
    - Reduce the construction period through careful logistical planning and productive implementation of resources.
    - Plan the placement of lay-down areas and any potential temporary construction camps along the corridor in order to minimise vegetation clearing.
    - Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
    - Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.

- Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
- Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
- Ensure that all infrastructure and the site and general surrounds are maintained and kept neat.
- Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.
- Monitor all rehabilitated areas for at least a year for rehabilitation failure and implement remedial action as required. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.

- Following construction, the maintenance of the reservoir is critical, and will ensure that the development does not degrade or become an eyesore.

The possible mitigation of both primary and secondary visual impacts as listed above should be implemented and maintained on an on-going basis.

7 IMPACT STATEMENT

In general, it is submitted that although the construction and operation of the proposed Bakubung Reservoir will have a visual impact on certain receptors within the surrounding region, this will not be extensive, and very few sensitive visual receptors are likely to be affected.

The proposed development is considered suitable for this context, and the proposed mitigation (Section 6.5) will go far in reducing the magnitude of visual impacts discussed by softening the appearance of the development

A summary of anticipated visual impacts, assuming mitigation is followed, are as follows:

- The visual impact on sensitive visual receptors (i.e. guests of Bakubung Lodge) in close proximity to the proposed development (i.e. within 0.5km).
  Moderate *visual impacts on limited guests of Bakubung Lodge are anticipated. Mitigating factors in this regard, however, is the peripheral location of the proposed Bakubung Reservoir (relative to the Bakubung Lodge) and the high VAC of the natural bush.*

- The visual impact on sensitive visual receptors (i.e. tourists using roads in Pilanesberg National Park) within the region (i.e. beyond the 1.5km offset).
  Low *visual impacts are anticipated. Mitigating factors in this regard, however, include the visual distance of these users from the proposed development site, the visual impact already encountered as a result of the existing Bakubung Lodge and the high VAC of the natural bush.*

- The visibility of the proposed development to, and potential visual impact on protected and conservation areas (i.e.Pilanesberg National Park) within the study area.
  Low *visual impacts are anticipated. The proposed development is unlikely to be seen from the areas where tourists are situated.*

- The anticipated visual impact on the visual character of the landscape and sense of place of the region.
  Negligible *visual impacts are anticipated. The proposed development is contextually appropriate.*

- Potential visual impacts associated with the construction phase.
  Low *visual impacts may be expected on the proposed site and receptors for a short period (i.e. the construction phase only).*

All impacts above are determined to be of moderate significance and can be mitigated to low.

In addition, none are considered to be fatal flaws from a visual perspective. This is based on the relatively low density of visual receptors within the study area, the relatively contained extent of the development and the possibility of mitigating the visual impacts expected.

8 CONCLUSION AND RECOMMENDATIONS

The construction and operation of the proposed Bakubung Reservoir will have a visual impact on the scenic resources of the study area.

However, mitigation of visual impact is possible 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 (see Section 6.5) should be followed and the mitigation 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 anticipated visual impacts are neither unacceptable in nature nor excessive in magnitude. Potential visual impacts are therefore not considered to be a fatal flaw for this development.

The relatively limited extent of visual receptors in the area and the high to moderate VAC of the area is a strong consideration in this regard.

Based on the above, it is the recommendation of the author that the proposed Bakubung Reservoir development, including all proposed components, be supported from a visual perspective, subject to the implementation of the required and recommended optimisation and mitigation measures detailed in Section 6.5.

9 REFERENCES/DATA SOURCES

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