



**PROPOSED DEVELOPMENT OF AN OFFICE PRECINCT WITHIN THE
MAPUNGUBWE NATIONAL PARK, LIMPOPO PROVINCE**

Viewshed Analysis

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Prepared for:



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Today's Impact | Tomorrow's Legacy

EXECUTIVE SUMMARY

Enviroworks was appointed by South African National Parks (SANParks) to compile the Viewshed Analysis for the proposed Mapungubwe Office Precinct in order to determine the Visual Impact of the proposed development within the area.

1 STUDY APPROACH

1.1 Methodology

The study was undertaken using Geographical Information System (GIS) software as a tool to generate a viewshed analyses and to apply relevant spatial criteria to the proposed development. A detailed Digital Elevation Model (DEM) for the study area (S23E29) was obtained from the National Aeronautics and Space Administration (NASA). The methodology utilised to identify issues to the visual impact include the following activities:

- The creation of a detailed digital terrain model of the potentially affected environment;
- The identification of sensitive environments upon which the proposed Office Precinct could have a potential impact on; and,
- The creation of viewshed analyses from the proposed Office Precinct in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analysis takes into account the dimension of the proposed office precinct and was calculated at a height of four and a half meters (4.5 m).

This Report (Visual Analysis) sets out to identify and quantify the possible visual impacts related to the proposed Office Precinct, as well as offer potential mitigation measures where required. The following methodology has been adopted for the assessment of the Viewshed:

- **Determine the Potential Visual Exposure**
The visibility or visual exposure of any structure or activity is the point of departure for the VIA. It stands to reason that if the proposed infrastructure was not visible, no impact will occur. Viewshed analyses of the proposed structures indicate the potential visibility.
- **Determine Visual Distance/Observer Proximity to the facility**
In order to refine the visual exposure of the proposed Office Precinct 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 structures.

Proximity radii for the proposed facility are created in order to indicate the scale and viewing distance of the structures and to determine the prominence of the structures in relation to their environment. The visual distance theory and the observer's proximity to the Office Precinct are closely related, and especially relevant, when considered from areas with a high viewer incidence and a predominantly negative visual perception of the proposed infrastructure.
- **Determine Viewer Incidence/Viewer Perception**
The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers, then there would be no visual impact. If the visual perception of the structure is favourable to all observers, 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 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 of the Natural Vegetation**

This is defined as 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 will 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 will 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 proposed Office Precinct does not incorporate the potential 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, supplemented with field observation.

➤ **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 the 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 the extent, duration, magnitude and probability.

1.2 Projections

Projected coordinate systems are defined by ArcGIS Resource Centre (The developers) as *"a flat, two dimensional surface. Unlike a geographical coordinate system, a projected coordinate system has constant lengths, angles, and areas across the two dimensions. A projected coordinate system is always based on a geographic coordinate system that is based on a sphere or spheroid"*. Projected Coordinates systems are world based and thus the larger the area the larger the distortion. To minimise the distortion the Universal Transverse Mercator (UTM) coordinate reference system divides the Earth into 60 equal zones that are all 6 degrees wide in longitude from East to West. Birkenhead is situated within the thirty four degree (34°) UTM Zone, thus the WGS84/UTM S35 (32735) was used as projection.

2 ASSUMPTIONS AND LIMITATIONS

- Information is assumed to be the latest available information.

- Visual impact studies and assessments depend, to some extent, on subjective judgements. The subjectivity, of the analysis relates to the value driven nature of VIA. However, to deal with subjectivity, the methodology of this VIA is explained and rating categories clearly defined.

3 RESULTS

3.1 Potential Visual Exposure (Preferred Position)

The combined result of the viewshed analysis for the proposed Office Precinct is displayed on the map below (Figure 1). The visibility analysis was undertaken at the height of the building measuring in at four and a half metres (4.5 m), in order to simulate the view from the building and to indicate prominence of the structures within the landscape. Furthermore; Figure 1 indicates proximity radii from the proposed Office Building as a reference to determine the Visual Absorption Capacity. It must be noted that the Digital Terrain Model (DTM) utilised from the viewshed analysis does not include the effect of vegetation cover and built structures. These features may influence the visual exposure to some degree.

The visual impact of the proposed Office Precinct will be low within the short distance zone (1 kilometer radius) due to the following:

1. The R572 road is not frequently travelled and the viewer perception will be temporary as motorists will only pass the development;
2. The Visual Absorption Capacity of the study area is considered to be moderate; which, will absorb the building to some degree;
3. Due to the moderate VAC of the study area the visual impact will decrease as distance between the Development and the Observer increases;
4. Due to the undulating topography of the study area the proposed development will only be visible towards the north east; however, the impact will be low due to the high VAC of the study area coupled with the limited observers that will be present within these areas.

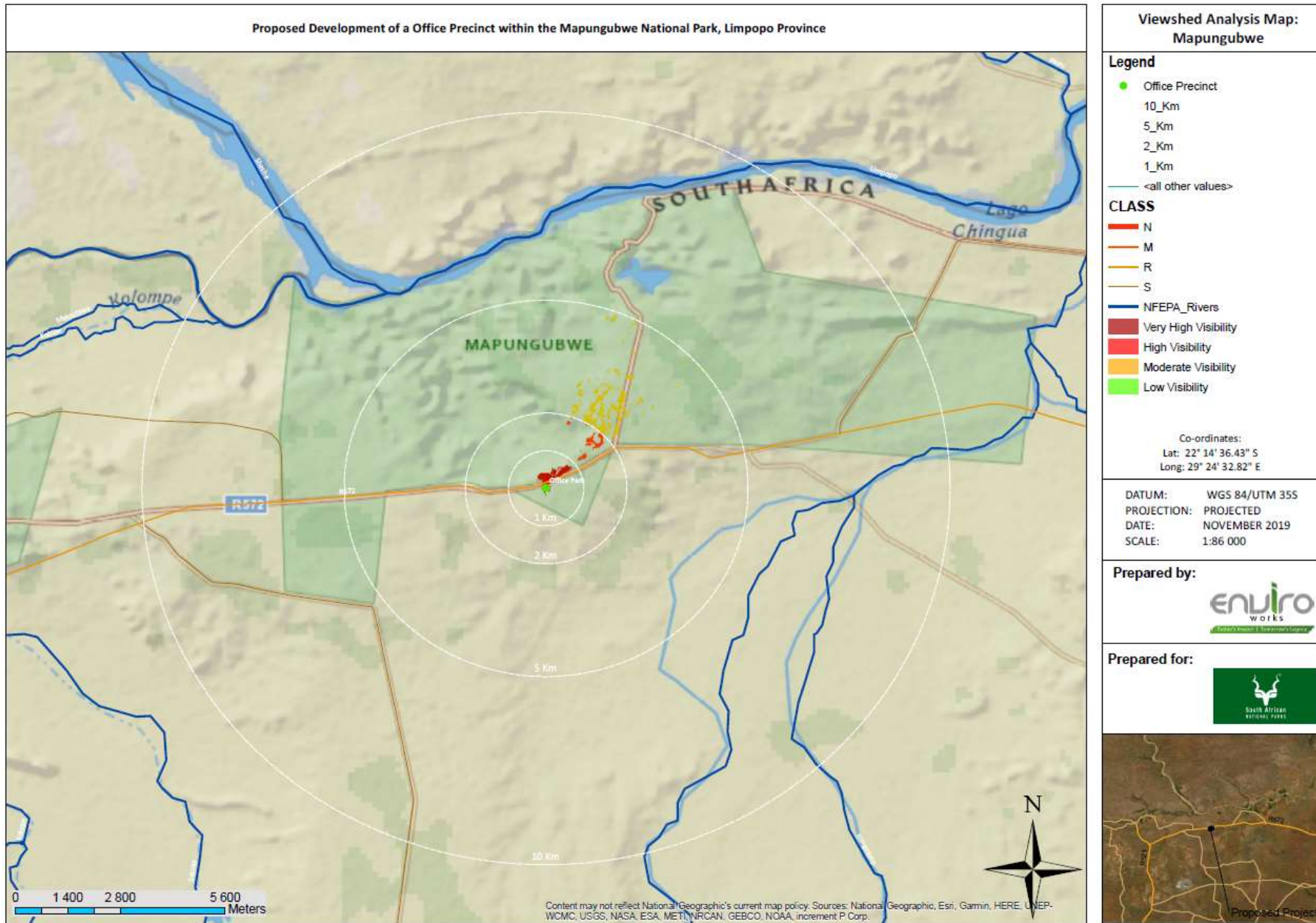


Figure 1: Viewshed Analysis of the Proposed Office Precinct, Mapungubwe National Park.