VIA Report

Visual Impact Assessment for the Proposed Swakop Uranium Husab Project, Swakopmund, Namibia

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PROPOSED SWAKOP URANIUM HUSAB PROJECT

SWAKOPMUND

NAMIBIA

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EXPERTISE OF SPECIALISTS

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Experience in Years:	3 years
Experience	Yonanda Martin has been doing visual impact assessments for Newtown Landscape Architects since 2006. She has experience in a wide range of visual impact assessments which include visual impacts for game lodges, transmission lines, roads, mines and telecommunication masts. Projects that she worked on include: • **Dorsfontein West Expansion** (GCS (Pty) Ltd), Kriel • **Ferreira Coal Mining** (GCS (Pty) Ltd), Ermelo • **Eskom Honingklip** (Kv3 Engineers), Muldersdrift • **SANRAL PWV3** (Jeffares & Green), Hartbeespoort

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Please refer to Appendix F for the Declaration of Independence and to Appendix G for the CV's of the specialists.

ABBREVIATIONS

CSIR	Council for Scientific and Industrial Research
EIA	Environmental Impact Assessment
IFC	International Finance Corporation
SACLAP	South African Council for the Landscape Architectural Profession
VIA	Visual Impact Assessment

GLOSSARY OF TERMS

Aesthetic Value

Aesthetic value is the emotional response derived from the experience of the environment with its particular natural and cultural attributes. The response can be either to visual or non-visual elements and can embrace sound, smell and any other factor having a strong impact on human thoughts, feelings and attitudes (Ramsay, 1993). Thus aesthetic value encompasses more than the seen view, visual quality or scenery, and includes atmosphere, landscape character and sense of place (Schapper, 1993).

Aesthetically significant place

A formally designated place visited by recreationists and others for the express purpose of enjoying its beauty. For example, tens of thousands of people visit Table Mountain on an annual basis. They come from around the country and even from around the world. By these measurements, one can make the case that Table Mountain (a designated National Park) is an aesthetic resource of national significance. Similarly, a resource that is visited by large numbers who come from across the region probably has regional significance. A place visited primarily by people whose place of origin is local is generally of local significance. Unvisited places either have no significance or are "no trespass" places. (after New York, Department of Environment 2000).

Aesthetic impact

Aesthetic impact occurs when there is a detrimental effect on the perceived beauty of a place or structure. Mere visibility, even startling visibility of a project proposal, should not be a threshold for decision making. Instead a project, by virtue of its visibility, must clearly interfere with or reduce (i.e. visual impact) the public's enjoyment and/or appreciation of the appearance of a valued resource e.g. cooling tower blocks a view from a National Park overlook (after New York, Department of Environment 2000).

Cumulative Effects

The summation of effects that result from changes caused by a development in conjunction with the other past, present or reasonably foreseeable actions.

Landscape Character

The individual elements that make up the landscape, including prominent or eye-catching features such as hills, valleys, woods, trees, water bodies, buildings and roads. They are generally quantifiable and can be easily described.

Landscape Impact

Landscape effects derive from changes in the physical landscape, which may give rise to changes in its character and how this is experienced (Institute of Environmental Assessment & The Landscape Institute, 1996).

Study area

For the purposes of this report the Swakop Uranium Husab Study area refers to the proposed site as well as the 'zone of potential influence' (the area defined as the radius about the centre point of the project beyond which the visual impact of the most visible features will be insignificant) which is a 20km radius surrounding the site.

Project Site

For the purposes of this report the Swakop Uranium Husab Project *site* refers to the actual layout of the mine.

Sense of Place *(genius loci)*

Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. *Genius loci* literally means 'spirit of the place'.

Sensitive Receptors

Sensitivity of visual receptors (viewers) to a proposed development.

Viewshed analysis

The two dimensional spatial pattern created by an analysis that defines areas, which contain all possible observation sites from which an object would be visible. The basic assumption for preparing a viewshed analysis is that the observer eye height is 1,8m above ground level.

Visibility

The area from which project components would potentially be visible. Visibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation and distance.

Visual Exposure

Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion and visual acuity, which is also influenced by weather and light conditions.

Visual Impact

Visual effects relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity.

Visual Intrusion

The nature of intrusion of an object on the visual quality of the environment resulting in its compatibility (absorbed into the landscape elements) or discord (contrasts with the landscape elements) with the landscape and surrounding land uses.

Worst-case Scenario

Principle applied where the environmental effects may vary, for example, seasonally to ensure the most severe potential effect is assessed.

Zone of Potential Visual Influence

By determining the zone of potential visual influence it is possible to identify the extent of potential visibility and views which could be affected by the proposed development. Its maximum extent is the radius around an object beyond which the visual impact of its most visible features will be insignificant primarily due to distance.

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1 INTRODUCTION

1.1 Project Overview

Newtown Landscape Architects (NLA) was commissioned by Metago Environmental Engineers (Pty) Ltd to carry out a Visual Impact Assessment (VIA) for the proposed Swakop Uranium Husab Project, Namibia. The VIA Report is in support of an Environmental Impact Assessment (EIA) according to the Environmental Management Act, 7 of 2007. The proposed Swakop Uranium Husab Project mining activities and associated infrastructure will consist of open pit mining, process plant, mine offices and workshops, storage facilities, tailings disposal and waste rock disposal as well as access roads.

1.2 Proposed Study area

The Swakop Uranium Husab Project site is situated approximately 55km east north east of Swakopmund on the northern boundary of the Namib Naukluft National Park (NNNP). For the purposes of this report the Swakop Uranium Husab Project *site* refers to the immediate area associated with the actual layout of the mine and the Swakop Uranium Husab Project *study area* refers to the proposed site as well as the 'zone of potential influence' (the area defined as the radius about the centre point of the project site beyond which the visual impact of the most visible features will be insignificant) which is a 20km radius surrounding the site.

1.3 Terms and Reference

A specialist study is required to assess the visual impacts arising from the proposed Swakop Uranium Husab Project. Based on the general requirements for a comprehensive VIA, the following terms of reference were established:

- Define the visual resource and sense of place of the area;
- Identify the sensitive viewers;
- Determine the visual impact using recognized international criteria and by simulating the key components of the mine;
- Assess the visual impact;
- Propose visual mitigation measures;
- Comply with the IFC Standards.

2 APPROACH AND METHODOLOGY

The World Bank's International Finance Corporation (IFC) Standards: Environmental, Health and Safety Guidelines for Mining does refer to Visual Impact Assessments. The following Visual Impact Assessment Standards, as per IFC Standards, were also considered:

"Mining operations, and in particular surface mining activities, may result in negative visual impacts to resources associated with other landscape uses such as recreation or tourism. Potential contributors to visual impacts include high walls, erosion, discolored water, haul roads, waste dumps, slurry ponds, abandoned mining equipment and structures, garbage and refuse dumps, open pits, and deforestation. Mining operations should prevent and minimize negative visual impacts through consultation with local communities about potential post-closure land use, incorporating visual impact assessment into the mine reclamation process. Reclaimed lands should, to the extent feasible, conform to the visual aspects of the surrounding landscape. The reclamation design and procedures should take into consideration the proximity to public viewpoints and the visual impact within the context of the viewing distance. Mitigation measures may include strategic placement of screening materials including trees and use of appropriate plant species in the reclamation phase as well as modification in the placement of ancillary facilities and access roads."

2.1 Approach

The assessment of likely effects on a landscape resource and on visual amenity is complex, since it is determined through a combination of quantitative and qualitative evaluations. (The Landscape Institute with the Institute of Environmental Management and Assessment, 2002). When assessing visual impact the worst-case scenario is taken into account. Landscape and visual assessments are separate, although linked, procedures.

The landscape, its analysis and the assessment of impacts on the landscape all contribute to the baseline for visual impact assessment studies. The assessment of the potential impact on the landscape is carried out as an impact on an environmental resource, i.e. the physical landscape. Visual impacts, on the other hand, are assessed as one of the interrelated effects on people (i.e. the viewers and the impact of an introduced object into a particular view or scene).

2.1.1 The Visual Resource

Landscape character, landscape quality (Warnock, S. & Brown, N., 1998) and "sense of place" (Lynch, K., 1992) are used to evaluate the visual resource i.e. the receiving environment. A qualitative evaluation of the landscape is essentially a subjective matter. In this study the aesthetic evaluation of the study area is determined by the professional opinion of the author based on site observations and the results of contemporary research in perceptual psychology.

Aesthetic value is the emotional response derived from the experience of the environment with its particular natural and cultural attributes. The response is usually to both visual and non-visual elements and can embrace sound, smell and any other factor having a strong impact on human thoughts, feelings and attitudes (Ramsay, 1993). Thus aesthetic value is more than the combined factors of the seen view, visual quality or scenery. It includes atmosphere, landscape character and sense of place (Schapper, 1993). Refer also to Appendix B for further elaboration.

Studies for perceptual psychology have shown human preference for landscapes with higher visual complexity, for instance scenes with water or topographic interest. On the basis of contemporary research, landscape quality increases where:

- Topographic ruggedness and relative relief increase;
- Water forms are present;
- Diverse patterns of grassland and trees occur;
- Natural landscape increases and man-made landscape decreases;
- Where land use compatibility increases (Crawford, 1994).

Aesthetic appeal (value) is therefore considered **high** when the following are present (Ramsay, 1993):

- Abstract qualities: such as the presence of vivid, distinguished, uncommon or rare features or abstract attributes;
- Evocative responses: the ability of the landscape to evoke particularly strong responses in community members or visitors;
- Meanings: the existence of a long-standing special meaning to a particular group of people or the ability of the landscape to convey special meanings to viewers in general;
- Landmark quality: a particular feature that stands out and is recognised by the broader community.

And conversely, it would be **low** where:

- Limited patterns of grasslands and trees occur;
- Natural landscape decreases and man-made landscape increases;
- And where land use compatibility decreases (after Crawford, 1994).

In determining the quality of the visual resource, both the objective and the subjective or aesthetic factors associated with the landscape are considered. Many landscapes can be said to have a strong sense of place, regardless of whether they are considered to be scenically beautiful but where landscape quality, aesthetic value and a strong sense of place coincide - the visual resource or perceived value of the landscape is considered to be very high. The criteria given in Appendix B are used to assess landscape quality, sense of place and ultimately to determine the aesthetic value of the study area.

2.1.2 Sensitivity of Visual Resource

The sensitivity of a landscape or visual resource is the degree to which a particular landscape type or area can accommodate change arising from a particular development, without detrimental effects on its character. Its determination is based upon an evaluation of each key element or characteristic of the landscape likely to be affected. The evaluation will reflect such factors such as its quality, value, contribution to landscape character, and the degree to which the particular element or characteristic can be replaced or substituted (Institute of Environmental Assessment & The Landscape Institute, 1996:87).

2.1.3 Sense of Place

Central to the concept of sense of place is that the landscape requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area. According to Lynch (1992), sense of place "is the extent to which a person can recognize or recall a place as being distinct from other places – as having a vivid, unique, or at least particular, character of its own". Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. In some cases these values allocated to the place are similar for a wide spectrum of users or viewers, giving the place a universally recognized and therefore, strong sense of place.

Because the sense of place of the study area is derived from the emotional, aesthetic and visual response to the environment, it cannot be experienced in isolation. The landscape context must be considered. With this in mind, the combination of the natural landscape (mountains, streams and the vegetation) together with the manmade structures (residential areas, roads, mining activities and power lines) contribute to the sense of place for the study area. It is these land-uses, which define the area and establish its identity.

2.1.4 Sensitive Viewer Locations

The sensitivity of visual receptors and views are dependent on the location and context of the viewpoint, the expectations and occupation or activity of the receptor or the importance of the view. This may be determined with respect to its popularity or numbers of people affected, its appearance

in guidebooks, on tourist maps, and in the facilities provided for its enjoyment and references to it in literature or art.

The most sensitive receptors may include:

- Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape;
- Communities where development results in changes in the landscape setting or valued views enjoyed by the community;
- Occupiers of residential properties with views affected by the development.

Other receptors include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value);
- People traveling through or past the affected landscape in cars or other transport modes;
- People at their place of work.

Views from residences and tourist facilities / routes are typically more sensitive, since views from these are considered to be frequent and of long duration.

2.1.5 Landscape Impact

The landscape impact of a proposed development is measured as the change to the fabric, character and quality of the landscape caused by the physical presence of the proposed development. Identifying and describing the nature and intensity of change in the landscape brought about by the proposed new mine is based on the professional opinion of the author supported by photographic simulations. It is imperative to depict the change to the landscape in as realistic a manner as possible (Van Dortmont in Lange, 1994). In order to do this, photographic panoramas were taken from key viewpoints and altered using computer simulation techniques to illustrate the physical nature of the proposed project in its final form within the context of the landscape setting. The resultant change to the landscape is then observable and an assessment of the anticipated visual intrusion can be made.

2.1.6 Visual Impact

Visual impacts are a subset of landscape impacts. Visual impacts relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effect with respect to visual amenity. Visual impact is therefore measured as the change to the existing visual environment (i.e. views) caused by the intervention and the extent to which that change compromises (negative impact) or enhances (positive impact) or

maintains the visual quality of the scene as perceived by people visiting, working or living in the area. This approach reflects the layman's concerns, which normally are:

- Will I be able to see the new development?
- What will it look like?
- Will the development affect views in the area and if so how?

Landscape and visual impacts do not necessarily coincide. Landscape impacts can occur with the absence of visual impacts, for instance where a development is wholly screened from available public views, but nonetheless results in a loss of landscape elements and landscape character within a localized area (the site and its immediate surrounds).

2.1.7 Intensity of Visual Impact

The intensity of visual impact is determined using visual intrusion, visibility and visual exposure criteria (Hull, R.B. and Bishop, I.E., 1988), qualified by the sensitivity of viewers (visual receptors) towards the proposed development. The intensity of visual impact is therefore concerned with:

- The overall impact on the visual amenity, which can range from degradation through to enhancement;
- The direct impacts of the mine upon views of the landscape through intrusion or obstruction;
- The reactions of viewers who may be affected.

For a detailed description of the methodology used in this study, refer to Appendix A, B and C. Image 1 below, graphically illustrates the visual impact process:

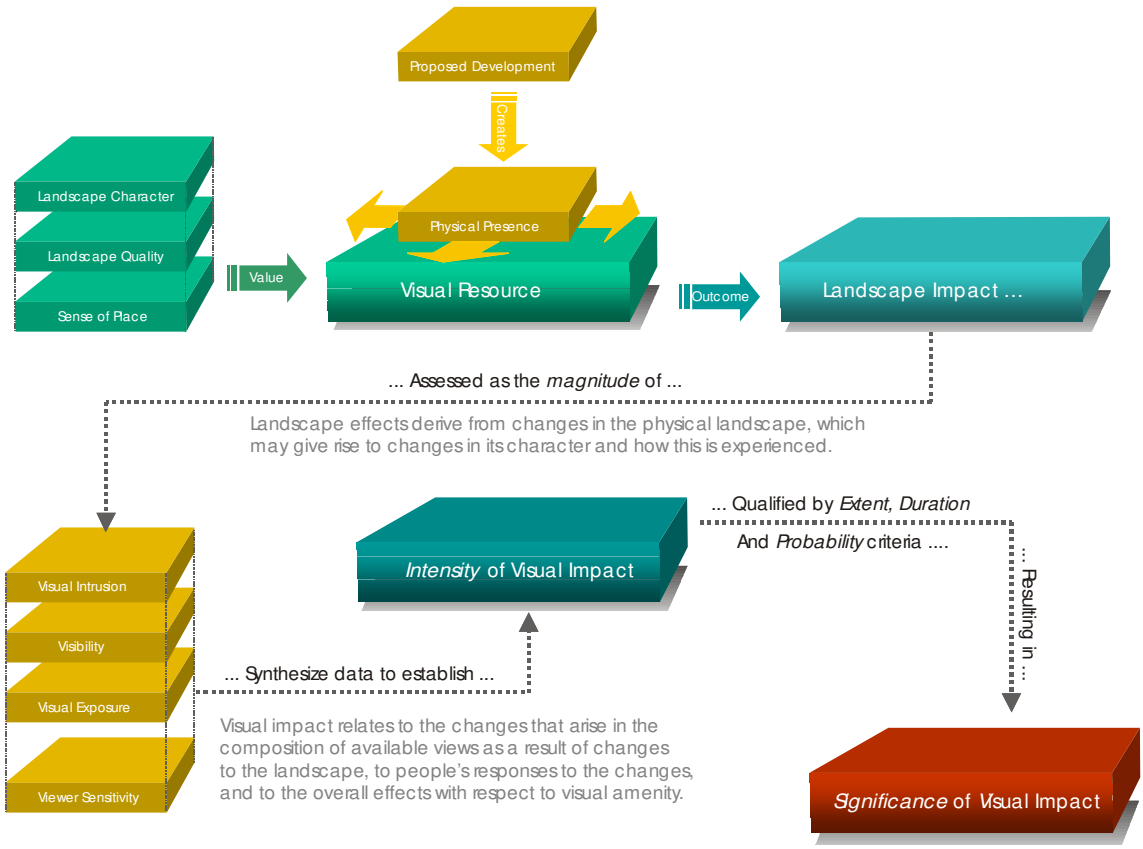

Image 1: Visual Impact Process

2.1.8 Significance of Visual Impact

The significance of impact was determined based on the Hacking method of determination of the significance of impacts. This method also complies with the method provided in the EIA guideline document.

Significance = consequence x probability

Consequence is a function of severity, spatial extent and duration

Severity, based on

- Intensity of impact (will the impact be of High, Moderate or Low intensity?) and

Scale/ spatial extent of impact

- Will the impact affect the national, regional or local environment, or only that of the site?

Occurrence duration, based on

- Duration of occurrence (how long may it last).

A detailed description of the significance rating criteria is included as Appendix C.

2.2 Methodology

The following method was used:

- Site visit. A field survey was undertaken and the study area scrutinized to the extent that the receiving environment could be documented and adequately described;
- Project components. The physical characteristics of the project components were described and illustrated;
- General landscape characterization. The visual resource (i.e. receiving environment) was mapped using field survey and GIS mapping technology. The description of the landscape focused on the nature of the land rather than the response of a viewer (refer to Appendix 1);
- Describe and map the **landscape character** of the study area. The description of the landscape focussed on the nature and character of the landscape rather than the response of a viewer;
- Describe the **quality of the landscape**. Aesthetic appeal is described using recognized contemporary research in perceptual psychology as the basis;
- Describe the **sense of place** of the study area as to the uniqueness and distinctiveness of the landscape. The primary informant of these qualities is the spatial form and character of the natural landscape together with the cultural transformations associated with the historic/current use of the land;
- Illustrate, in very basic **simulations,** the proposed project overlaid onto panoramas of the landscape, as seen from nearby sensitive viewing points to give the reviewer an idea of the scale and location of the proposed project within their landscape context;
- Determine precise **visual intrusion** (contrast) of the proposed project by simulating its physical appearance from sensitive viewing areas;
- Determine **the visibility** of the proposed project by conducting detailed viewshed analyses;
- **Rate the impact** on the visual environment and sense of place of the proposed mine based on a professional opinion and the method described below; and
- Suggest measures that could mitigate the negative impacts of the proposed mining project.

3 DESCRIPTION OF THE PROJECT

3.1 Construction Phase

Construction activities are those activities which will take place during the establishment and preparation of the site for mining and mineral processing. Some mining activities however will commence in the construction phase, such as mining of ore which will continue into the operation phase. The following activities will occur during the construction phase:

- Site clearing;
- Topsoil stripping (and stockpiling);
- Development of a construction camp and associated facilities;
- Construction of a process plant;
- Construction of permanent access routes within the site;
- Development of the open pit;
- Exposure and stockpiling of ore for processing as the plant is commissioned;
- Obtaining borrow material for construction;
- Power supply for construction;
- Water supply for construction

The following facilities will be developed during the construction phase:

- Workshop and maintenance area;
- Stores for storing and handling fuel, lubricants, solvents, paints and construction materials;
- Contractors lay-down area/s;
- Mobile site offices;
- A canteen;
- A temporary waste collection and storage area;
- A wash bay for washing equipment and vehicles;
- A parking area for cars and equipment;
- Change houses.

3.1.1 Construction Site Camp

A construction camp will be built on site to accommodate the labour force required during this phase. The camp will be south-west of the plant complex and attached to the same block. The construction camp will accommodate between 2000 and 4000 people.

3.2 Operational Phase

The operational phase will consist of the following facilities:

- Two open pits – Zone 1 and Zone 2;
- Primary crusher;
- Process plant;
- Acid plant;
- Mineralised waste disposal facilities (waste rock and tailings/filter cake);
- Site offices and associated structures such as ablution blocks, etc.;
- Sewage treatment plant;
- Ore storage areas;
- Conveyors;
- Soil stockpiles;
- Workshops and associated structures such as stores, changing rooms, etc.;
- Power infrastructure;
- Mine access road and various internal mine roads.

3.2.1 Mining

Operational activities include the open cast mining for uranium from two open pits, zone one (Zone 1) and zone two (Zone 2), please refer to Figure 1: Locality and Views.

3.2.2 Co-disposal Facility

The proposed co-disposal facility will be a conjoined tailings and waste rock disposal facility. The conjoined facility will be made up of three separate 'compartments'. The northern section of the dump will be made up of waste rock. The central 'compartment will accommodate the tailings or filtercake from the plant, together with the barren liquor. The southern portion of the dump will again be made up of waste rock.

4 THE ENVIRONMENTAL SETTING

4.1 The Study Area

The Swakop Uranium Husab Project site is situated approximately 55km east-north-east of Swakopmund and within the northern boundary of the Namib Naukluft National Park. The land use of the study area is predominately nature reserve/ park with tourist facilities scattered throughout the area. There are however other mining activities that occur within the study are i.e. Rossing Uranium and Langer Heinrich Uranium Mine which falls just outside the study area to the south east of the project site. Refer to Figure 1: Locality and Views as well as Figure 2: Visual Resource.

4.2 Surrounding Land Use

4.2.1 Residential

As previously mentioned the proposed site for the Swakop Uranium Husab Project is located on the northern boundary of the Namib Naukluft National Park. This specific section of the Namib Naukluft National Park is predominantly a tourist area as the Moon Valley Landscape and the Welwitchia Vlaktes are located within this section. A number of dwellings occur within this section of the Namib Naukluft National Park as well as in areas immediately outside the Park are used as residences houses and also offer accommodation for tourists. These dwellings are located to the southwest of the Swakop Uranium Husab Project site as well as to the east and the north east of the site. Refer to Figure 2: Visual Resource.

The closest towns are Arandis, which is a small mining town approximately 18km north north east of the stie, Swakopmund which is approximately 55km west-south-west of the site and Walvis Bay which is approximately 65km south-west of the site. Neither of these areas will be affected by the mine.

4.2.2 Tourism

The Namib Naukluft National Park is a very well-known tourist destination and in the vicinity of the project site a number of attractions occur. These include the Moon Landscape, Welwitchia Vlaktes as well as tours through the historical mining areas such as the Khan Mine (12 km north east of the project site). Other tourist activities that occur within the study area include camping sites as well as 4 x4 tours which occurs general across area as well as along the dry riverbeds (Khan River). A unique tourist attraction is star gazing from the lodges/ tourist accommodation in the surrounding areas. Tourist accommodation within the study area includes Moon Valley Camp, Swakop River Palmenhosrt Farm, Wüstenquell and Jakkelswater.

4.2.3 Infrastructure and Mining

The project site is located in the desert and there is currently no infrastructure except for the sandy desert roads. Infrastructure occurring within the study area includes the power lines and substation

along the C28. There are also prospecting activities taking place within the study area (mostly south of the project site). Other mines in the region include Rossing Uranium Mine approximately 5km north of the project site and the Langer Heinrich Uranium Mine approximately 35 km southeast of the Swakop Uranium Husab project site.

4.2.4 Transportation systems

The main roads include the C28 that is located to the south of the Swakop Uranium Husab Project, this road is the main route between Swakopmund and Windhoek, the B2 (road towards Karibib and Arandis) is located to the north and west of the Swakop Uranium Husab Project. Other roads surrounding the Swakop Uranium Husab Project include the D1914 tourist route that runs along the Moon Valley Landscape and Welwitchia Vlaktes, and private roads that connect to the Swakop Uranium Husab Project site.

4.3 Landscape character

Landscape character types are landscape units refined from the regional physiographic and cultural data derived from 1:50 000 topographical maps, aerial photographs and information gathered on the site visit. Dominant landform and land use features (e.g., hills, rolling plains, valleys and urban areas) of similar physiographic and visual characteristics, typically define landscape character types. Refer to the views in Figures 3 – 6, which illustrate the nature and character of the study area. The viewpoints locations are indicated in Figure 1.

The study area has a rolling to flat topography with mountains surrounding the proposed project site to the north, west, south and south east. There are smaller koppies directly east and to the north-east of the project site. Non-perennial washes and channels traverse the proposed project site.

The Swakop Uranium Husab Project site falls within the Namib Desert (Atlas of Namibia, 2002). The vegetation within the study area is sparsely distributed. Most of the plants are found within the washes and channels and are predominantly grasses. There are however trees scattered throughout the area and more specifically located closer to the farm houses and tourist facilities. The area directly surrounding the Swakop Uranium Husab Project site is also well known for the Welwitchia Vlaktes, which is one of the main tourist attractions in this particular section of the Namib Naulkluft National Park.

Man-made structures that occur within the study area are existing prospecting activities, the Rossing Uranium Mine to the north of the site, the Husab mining camp, and tourist facilities as described in 4.2.2 above. Figure 2: Visual Resource, illustrates the spatial distribution of the various landscape character types

5 VISUAL RESOURCE

5.1 Visual Resource Value / Scenic Quality

The landscape as described in Section 4.3 can be divided into basic landscape character types, each with its own set of physical, visual and aesthetic characteristics. The spatial distribution of these landscape types is illustrated in Figure 2: Visual Resource. The figure also indicates the scenic quality of each type and the resultant landscape resource sensitivity.

Scenic quality ratings (using the scenic quality rating criteria described in Appendix B) were assigned to each of the landscape types defined in Figure 2: Visual Resource. The *highest* value is assigned to the mountains and koppies that surround the proposed site to the north, south east, south and west. The vegetated washes and channels as well as the Welwitchia Vlaktes were also rated as high. The tourist facilities and farm houses are rated moderate.

The landscape types with the lowest scenic quality rating are the existing prospecting and mining activities, linear infrastructure (roads, railway and power lines) as well as towns (Arandis).

Based on the discussion in this section, the experience of the author and the criteria in Appendix B, the scenic quality value for the landscape within the study area is rated ***high.*** Although there are landscape types (mines and linear infrastructure) with a very low visual resource value and which could compromise the scenic beauty of the study area, the dominant landscape type is the natural landscape with the mountains and koppies. These landscape features form the backdrop to many views in the study area and therefore the over quality of of the landscape remains high. This is also mainly due to the fact that the lower quality (roads, power lines and mining activities) landscape units are not all that visible throughout the site and only become visible when the viewer is close to the activity. A summary of the visual resource values is tabulated in Table 1 below.

Table 1: Value of the Visual Resource/ Scenic Quality – Swakop Uranium Husab Project
(After The Landscape Institute with the Institute of Environmental Management and Assessment (2002))

High Mountains/ koppies, washes & channels and the Welwitchia Vlaktes	**Moderate** Tourist facilities and Farm houses	**Low** Transport infrastructure, mining activities and power lines.
This landscape type is considered to have a *high* value because it is a: **Distinct landscape that exhibits a very positive character with valued features that combine to give the experience of unity, richness and harmony. It is a landscape that may be considered to be of particular importance to conserve and which has a strong sense of place. It may be sensitive to change in general and may be detrimentally affected if change is inappropriately dealt with.**	This landscape type is considered to have a *moderate* value because it is a: **Common landscape that exhibits some positive character but which has evidence of alteration /degradation/erosion of features resulting in areas of more mixed character. It is potentially sensitive to change in general and change may be detrimental if inappropriately dealt with but change may not require special or particular attention to detail.**	This landscape type is considered to have a *low* value because it is a: **Minimal landscape generally negative in character with few, if any, valued features**. Scope for positive enhancement could occur.

Sections that are placed in bold are applicable to the study area.

5.2 Sensitivity of Visual Resource

Figure 2: Visual Resources indicates all landscape elements evident within the study area. These landscape elements are described in Section 4.3 Figure 2 also rates the relative landscape sensitivity of the landscape types, with the mountains, koppies, washes, channels and Welwitchia Vlaktes constituting the highest sensitivity and the mining activities and infrastructural elements such as roads and power lines the lowest value.

5.3 Sense of Place

The sense of place for the proposed study area is as a result of a combination of all landscape types and their impact on the senses. The natural environment with the mountains and koppies in the background and the endless desert in the foreground gives the area a serene sense of place. The tourist attractions, such as the moon landscape, Welwitchiavlakte and guest / farm houses within the

area, evoke a sense of excitement and anticipation. The exploration and mining activities in the study area however contrast with this and almost create a sense of disenchantment. However, due to the dominance of the natural landscape the overall sense of place for the majority of the study area can still be described as tranquil.

6 VISUAL RECEPTORS

6.1 Views

The proposed project site is located on the border of the Namib Naukluft National Park. The project site is surrounded by mountains and koppies to the north, west, south and east and non-perennial washes and channels traverse this area. To the south of the project site is the well-known Welwitchia Vlaktes and to the south-west is the Moon Valley Landscape.

6.1.1 Sensitive Viewer Locations

As previously mentioned the proposed study area is located just inside the northern border of the Namib Naukluft National Park. The study area is rich in tourist attractions and therefore the most sensitive viewers will be the tourists that travel through the study area visiting the different tourist attractions and accommodation facilities. Therefore the tourist routes, tourist attraction areas as well as the tourist accommodation facilities are regarded as the most sensitive viewer locations.

6.1.2 Non - Sensitive Viewer Locations

The least sensitive receptors are likely to be people engaged in activities that focuses on their work or activity and who therefore may be potentially less susceptible to changes in their views (Institute of Environmental Assessment & The Landscape Institute, 1996).

Non sensitive viewer locations will include views from the existing mining activities and from the private mine roads surrounding and within the project site.

Table 2: Potential Sensitivity of Visual Receptors – Swakop Uranium Husab Project

High **Viewers visiting tourist areas, farm houses and travelling along tourist routes**	Moderate	**Low** **Viewers visiting mining / prospecting activities and travelling along local mining roads**
Users of all outdoor recreational facilities including public rights of way (tourist routes), whose intention or interest may be focused on the landscape; **Communities where the development results in changes in the landscape setting or valued views enjoyed by the community;**	People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value); People travelling through or past the affected landscape in cars, on trains or other transport routes;	**The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view (i.e. office and industrial areas).**

Sections that are placed in bold are applicable to the proposed mine.

7 LANDSCAPE and VISUAL IMPACT

7.1 Landscape Impact

The *landscape impact* (i.e. the change to the fabric and character of the landscape caused by the physical presence of a development) of the proposed Swakop Uranium Husab Project will be ***high*** as the physical impact of the construction / start-up and operation of the mining activities and the co-disposal dump will disturb a large percentage of the proposed study site. The main disturbance would be during the construction / start-up and operational phase as the proposed activities will create dust and the plant and co-disposal site will reach its maximum height. After decommissioning and closure the proposed site will be rehabilitated but the co-disposal dump remains and will continue to have a visual impact.

However, as stated in the approach, the physical change to the landscape at the project site must be understood in visibility and aesthetic terms within the context of the study area. The following sections discuss the effect that the proposed project will have on the visual and aesthetic environment.

7.2 Severity of Visual Impact

The severity of visual impact is determined using visibility, visual intrusion, visual exposure and viewer sensitivity criteria. When the severity of impact is qualified with spatial, duration and probability criteria the significance of the impact can be predicted (refer to Appendix B).

7.2.1 Visual Intrusion

The landscape impact of the project is measured as the change to the fabric, character and quality of the landscape (visual resource) caused by the physical presence of the proposed new mining activities. Visual intrusion is measured as the severity of intrusion that the project will have on available views, specifically those from within sensitive or critical viewing areas.

Visual intrusion deals with the notion of contextualism i.e. how well does a project component fit into the cultural aesthetic of the landscape as a whole? As discussed in Section 4.3, the study area is characterised by a rolling to flat topography with mountains surrounding the proposed site to the north, west, south and south east. Vegetation within this study area is very sparingly distributed allowing for open unobstructed views.

The only man-made structures that currently occur within the area are the existing prospecting activities and Rossing Uranium Mine approximately 5km to the north of the project site. The focus therefore of people, visiting, working or travelling through the study area is primarily on the landscape.

For the reasons mentioned above, the proposed Swakop Uranium Husab project will have a ***high*** visual intrusion on sensitive viewing areas during the construction / start-up phase of the project. During this phase dust and construction vehicles using the local roads will also exacerbate the impact of the activities taking place at the project site. It is therefore recommended that appropriate dust control measures should be implemented to minimize the dust fallout. During the construction / start-up phase the visual intrusion will increase as the process plant structures gets built and the mining features no longer disappear into the background as they will begin to protrude above the ground level.

During the operational phase the visual intrusion will remain ***high*** as in addition to the other mining activities, the co-disposal dump will start to grow and reach its maximum height. During the decommissioning and closure phase the visual intrusion will stay ***high*** as the co-disposal dump would remain visible.

Please refer to Figures 7 – 10 for the simulations of the proposed plant and co-disposal site.

Taking the *worst case scenario* into account Table 3 rates and summarises the visual intrusion for the study area.

Table 3: Visual Intrusion – Swakop Uranium Husab Project

High	Moderate	Low	Positive
Because the proposed project: **- Has a substantial negative effect on the visual quality of the landscape;** **- Contrasts dramatically with the patterns or elements that define the structure of the immediate landscape;** - **Contrasts with land use, settlement or enclosure patterns of the immediate environment;**	Because the proposed project: - Has a moderate negative effect on the visual quality of the landscape; - Contrasts with the patterns or elements that define the structure of the landscape; - Is partially compatible with land use (utilities) patterns of the general area. - Is partially 'absorbed' into the landscape from key viewing areas	Because the proposed project: - Contrasts minimally with the patterns or elements that define the structure of the landscape; - is mostly compatible with land use, (utility) patterns. - is 'absorbed' into the landscape from key viewing areas	The proposed project: - Has a beneficial effect on the visual quality of the landscape; - Enhances the patterns or elements that define the structure of the landscape; - Is compatible with land use, settlement or enclosure patterns.

- Cannot be 'absorbed' into the landscape from key viewing areas *Result*: **Notable change in landscape characteristics over an extensive area and/or intensive change over a localized area resulting in major changes to key views**	*Result* Moderate change in landscape characteristics over localized area, resulting in a moderate change to key views	*Result* Moderate change in landscape characteristics over localized area resulting in a minor change to a few key views.	*Result* Positive change in key views.

Sections that are placed in bold are applicable to the proposed Swakop Uranium Husab Project.

7.2.2 Visibility

In determining the visibility of the project, the worst-case scenario i.e. visibility of the project's features at a variety of heights and locations, was used. To do this, vantage points were assigned at offsets equivalent to the height above ground level of the proposed project. The 'zone of potential influence' (the area defined as the radius about the centre point of the project beyond which the visual impact of the most visible features will be insignificant) was established at 20km. Over 20km the impact of the proposed mining project is insignificant due to the diminishing effect of distance and atmospheric conditions (haze) on visibility.

A viewshed analysis was undertaken for the co-disposal site (with a maximum height of 180m for the waste rock section and 100m for the co-disposal section) as this would be the most visible / intrusive feature of the mine. The maximum height of the process plant is 50m (stack) and 35m for the Husab Substation. The spatial patterns generated by the viewshed analysis are illustrated in Figure 13 and indicates areas from which the project can potentially be seen.

The viewshed analysis (Figure 11) for the Swakop Urnaium Husab project indicates that the project will be highly visible from approximately 50 - 60% of the 'zone of potential influence'. Tourist facilities (Welwithchia Vlakte) near the proposed project site (within 7.5km) will have a clear view of the proposed mining activities. Due to the surrounding mountains views from north of the mountains are either obstructed or totally screened. The smaller koppies to the south of the proposed project also screen some of the views towards the proposed Swakop Uranium Husab project.

The potential visual impact of the proposed Swakop Uranium Husab project after sunset will be significant for viewers visiting tourist facilities, specifically the Welwitchia camp, located approximately 7km south west if the co-disposal dump. Light sources at night, particularly poorly directed security

flood lighting, can influence the visual impact of a development and therefore extra care should be taken when implementing the mitigation measures. Unobstructed light sources can cause a general glow in the area and will be visible from significantly longer distances than any structural features during daylight hours. It is possible that the glow from the proposed project will be visible from quite a distance. It should however be kept in mind that in the instance of the Wüstenquell and Jakkelswater Guest Houses the distance, atmospheric conditions (mist) as well as the mountains (Pforteberg and Husabberg) play a major role in screening the proposed project and therefore the glow created by the Swakop Uranium Husab Project would most likely not be visible from these guest houses.

Using the criteria in Table 4, visibility of the project will be ***high*** for tourist facilities and residential areas that are located within 7.5km from the proposed project (Welwitchiavlakte and camp site and tourist roads). The visibility will decrease to ***moderate – low*** for viewers located further than 7.5km from the proposed project.

Table 4: Visibility of the proposed Swakop Uranium Husab Project

High	Moderate	Low
Visual Receptors **If the project is visible from over half the zone of potential influence, and/or views are mostly unobstructed and/or the majority of viewers are affected.**	*Visual Receptors* If the project is visible from less than half the zone of potential influence, and/or views are partially obstructed and or many viewers are affected	*Visual Receptors* If the project is visible from less than a quarter of the zone of potential influence, and/or views are mostly obstructed and/or few viewers are affected.

Sections that are placed in bold are applicable to the proposed mine.

7.2.3 Visual Exposure

Visual exposure is rated using four increments of severity, each with their respective qualification and contribution to visual impact. The visual exposure curve in Figures 11 graphically illustrates these increments.

Table 5: Visual Exposure Ratings for the Swakop Uranium Husab Project

Effects specific to the project is given in **bold**

	High Exposure (significant contribution to visual impact)	**Moderate Exposure (moderate contribution to visual impact)**	**Low Exposure (minimal influence on visual impact)**	Insignificant Exposure (negligible influence on visual impact)
Welwitchiavlakte and camp site and tourist roads	**0 – 7.5 km**	**7.5 – 15.0 km**	**15.0 – 20.0 km**	Over 20.0 km
Motorists on local roads	**0 – 7.5 km**	**7.5 – 15.0 km**	**15.0 – 20.0 km**	Over 20.0 km

7.2.4 Sensitivity of Visual Receptors

When visual intrusion, visibility and visual exposure are incorporated, and qualified by sensitivity (visual receptors) criteria the intensity of the visual impact of the proposed project can be determined.

Table 6: Sensitivity of Receptors – Swakop Uranium Husab Project

High	**Moderate**	**Low**
Users of all outdoor recreational facilities including public rights of way (tourist routes), whose intention or interest may be focused on the landscape; Communities where the development results in changes in the landscape setting or	People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value); People travelling through or past the affected landscape in cars,	The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view (i.e. office and industrial areas).

valued views enjoyed by the community; Occupiers of residential properties with views affected by the development.	on trains or other transport routes;	Roads going through urban and industrial areas

Sections that are placed in bold are applicable to the proposed mine.

Given the criteria in Table 6, the sensitivity of viewers to change in the visual environment brought on by the physical presence of the project is ***high.***

7.2.5 Severity of Visual Impact

In synthesising the criteria used to establish the intensity of visual impact, a numerical or weighting system is avoided. Attempting to attach a precise numerical value to qualitative resources is rarely successful, and should not be used as a substitute for reasoned professional judgement. (Institute of Environmental Assessment & The Landscape Institute, 1996). The ratings for each of these criteria are indicated in Table 7 and derived from the discussion in the preceding sections. These results are based on *worst-case scenarios* when the impact of all aspects is taken together and when viewed by sensitive viewers (tourist facilities).

Table 7: Severity of Impact of the proposed Swakop Uranium Husab Project

High	Moderate	Low	Negligible
Total loss of or major alteration to key elements/features/characteristics of the baseline. **I.e. Pre-development landscape or view and/or introduction of elements considered to be totally uncharacteristic when set within the attributes of the receiving landscape.**	Partial loss of or alteration to key elements/features/characteristics of the baseline. I.e. Pre-development landscape or view and/or introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes	Minor loss of or alteration to key elements/features/characteristics of the baseline. I.e. Pre-development landscape or view and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape.	Very minor loss or alteration to key elements/features/characteristics of the baseline. I.e. Pre-development landscape or view and/or introduction of elements that is not uncharacteristic with the surrounding landscape – approximating the 'no change' situation.

High scenic quality impacts would result.	of the receiving landscape. Moderate scenic quality impacts would result	Low scenic quality impacts would result.	Negligible scenic quality impacts would result.

According to the results tabulated in Table 7 the *severity* of visual impact during the construction / start-up phase will be ***high*** as a new project will be introduced into a natural environment with few existing man-made interventions. During this phase the main visual issues will be the effects of dust and the structures being built. During the operational phase the severity of impact will be ***high*** as the co-disposal dump will become more visible. The decommissioning and closure phase will also have a ***high*** severity rating as the structures are removed, dust created and the co-disposal dump remains.

8 SIGNIFICANCE OF VISUAL IMPACT

Table 8 below summarises the results of the criteria (refer to Appendix C for description of criteria) used to determine the significance of the visual impact. These results are based on worst-case scenarios when the impact of all aspects is taken together. The ratings for impact with mitigation assume the effective implementation of the mitigation measures described in Section 9.

According to the results tabulated below in Table 8 the significance of visual impact during the construction / start-up phase will be ***medium*** and operational phases will be ***high***. The visual impact and impact on sense of place of the project will contribute to the cumulative negative effect on the aesthetics within the study area.

The Hacking Method was used to determine the significance of the impact, refer to Annexure C for the detailed criteria table.

Table 8: Summary of Visual Impacts and Mitigation Measures – Swakop Uranium Husab Project

Environmental Impacts	Severity (see Table 7)	Duration	Spatial Scale	Probability	*Significance* without Mitigation / *Significance* with Mitigation	Mitigation Measures	Mitigation Potential
Construction/ start-up Phase							
- The proposed project is located in a landscape of high value - The operational activities are visible from more than half the zone of potential influence, - Construction activities (start up) will cause a major change in landscape characteristics over a localized area resulting in a high change in key views and have a high negative effect on the visual quality of the area. - Construction activities will add to the cumulative negative effect on the visual quality of the landscape.	High	Low	Medium	High	**Medium** **Medium**	• Dust suppression techniques should be in place at all times during the construction and operational phases. • Where a paved road surface is required, paving materials with 'earthy' tones that complement the natural red/brown colours and textures of the soils in the area should be used. • Rehabilitate/restore exposed areas as soon as possible after construction activities are complete. • Paint buildings and structures with colours that reflect and complement the natural browns of the surrounding landscape. Avoid pure light colours and pure blacks. • To reduce the potential of glare external surfaces of buildings and structures should be articulated or textured to create interplay of light and shade. • Avoid high pole top security lighting along the periphery of the project site and use only lights that are activated on illegal entry to the project site. • Light public movement areas (pathways and roads) with low level 'bollard' type lights and avoid post top lighting.	Reasonable

Environmental Impacts	Severity (see Table 7)	Duration	Spatial Scale	Probability	*Significance* without Mitigation / *Significance* with Mitigation	Mitigation Measures	Mitigation Potential
Operational Phase							
- The proposed project is located in a landscape of high value - The operational activities are visible from more than half the zone of potential influence, - The operation will cause intensive change over a fairly widspread area resulting in major changes in key views from nearby sensitive viewing areas. - Operational activities will add to the cumulative negative effect (adding to prospecting and mining within the study area) on the visual quality of the landscape.	High	High	Medium	High	**High** / **High**	• Dust suppression techniques should be in place at all times during the construction and operational phases. • Avoid high pole top security lighting along the periphery of the project site and use only lights that are activated on illegal entry to the project site. • Light public movement areas (pathways and roads) with low level 'bollard' type lights and avoid post top lighting. • Employ a Professional Landscape Architect to assist with the rehabilitation as well as the final design of the co-disposal site.	Poor due to plant and co-disposal dump appearing in foreground views from a sensitive viewing area
Decommissioning and Closure Phase							
- The proposed project is located in a landscape of high value - The co disposal dump are visible from more than half the zone of potential influence, - During decommissioning the structures will be removed and the area of their footprint rehabilitated. - The co-disposal dump will however remain on site and will have permanent visual impact.	High	High	Medium	High	**High** / **High**	• Dust suppression techniques should be in place at all times during the decommissioning and closure phases. • Employ a Professional Landscape Architect to assist with the rehabilitation as well as the final design (contouring) of the co-disposal site	Poor due to co-disposal dump remaining as a feature in the Islandscape

9 MITIGATING MEASURES

In considering mitigating measures there are three rules that were considered - the measures should be feasible (economically), effective (how long will it take to implement and what provision is made for management / maintenance) and acceptable (within the framework of the existing landscape and land use policies for the area). To address these, the following principles have been considered:

- Mitigation measures should be designed to suit the existing landscape character and needs of the locality. They should respect and build upon landscape distinctiveness.
- It should be recognized that many mitigation measures, especially the establishment of planted screens and rehabilitation, are not immediately effective.

Mitigation measures would relate mostly to 'good housing keeping issues and will not be sufficient to significantly reduce the impact of the proposed mining project. To this end we nevertheless propose that the following activities be implemented.

9.1 Earthworks

- Dust suppression techniques should be in place at all times during the construction/ start-up, operational, the decommissioning and closure phases.

9.2 Landscaping

- If at all possible the co-disposal dump should be shaped in such a way that it blends with the contours of hill / mountain features of the surrounding landscape, see simulations in Figure 7-10.
- The side slopes should be designed in such a way that they are articulated to form natural shade areas.
- Another alternative that could be considered is to use a chemical, such as Permeon, that ages the rock and gives it a more natural feeling or texture. The cost implications should however be considered.
- A professional Landscape Architect should assist with the final design of the co-disposal dump

9.3 Access Roads

During construction / start-up, operation, decommissioning and closure of the development, access roads will require an effective dust suppression management programme, such as regular wetting and / or the use of non-polluting chemicals that will retain moisture in the road surface.

9.4 Lighting

Light pollution should be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances. Security and aesthetic flood lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas. Wherever possible, lights should be directed downwards so as to avoid illuminating the sky.

The negative impact of night lighting, glare and spotlight effects, can be mitigated using the following methods:

- Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the complex – this is especially relevant where the edge of the complex is exposed to residential properties.
- Avoid high pole top security lighting along the periphery of the project site and use only lights that are activated on movement at illegal entry to the site.
- Use security lighting at the periphery of the project site that is activated by movement and are not permanently switched on.

As part of the mitigation measures it is suggested that as far as possible concurrent rehabilitation should take place to minimize the intensity of the visual impact.

A registered Landscape Architect (SACLAP) should be appointed to design the relevant mitigation measures and to ensure that they are effectively implemented.

10 CONCLUSION

The landscape impact of the proposed Swakop Uranium Husab Project will be ***high*** as the physical impact of the construction / start-up and operation of the mining activities and the co-disposal dump will disturb a large percentage of the proposed project site.

Due to the flat topography and general openness of the study area the proposed Swakop Uranium Husab Project will be **highly** visible. In addition to the mining and prospecting in the study area, the study area is well-known for its tourist appeal, specifically the Welwitchia Vlaktes and other tourist attractions such as the Moon Valley and the general appeal of the 'wilderness' landscape that 4 x 4 enthusiasts enjoy. Tourists visit and travel through the study area and also stay at camp sites and tourist accommodation facilities that will be affected by the mining operations. Most tourist impact however is contained to the areas south and west of the project site. Visual impact during the construction / start-up phase will be ***moderate*** and will become ***high*** during the operational and closure phase.

Mitigation measures are feasible but mostly from a 'good housekeeping' point of view and will not be able to reduce the significance of impact.

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Appendix A
DETERMINING A LANDSCAPE AND THE VALUE OF THE VISUAL RESOURCE

In order to reach an understanding of the effect of development on a landscape resource, it is necessary to consider the different aspects of the landscape as follows:

Landscape Elements and Character

The individual elements that make up the landscape, including prominent or eye-catching features such as hills, valleys, savannah, trees, water bodies, buildings and roads are generally quantifiable and can be easily described.

Landscape character is therefore the description of pattern, resulting from particular combinations of natural (physical and biological) and cultural (land use) factors and how people perceive these. The visual dimension of the landscape is a reflection of the way in which these factors create repetitive groupings and interact to create areas that have a specific visual identity. The process of landscape character assessment can increase appreciation of what makes the landscape distinctive and what is important about an area. The description of landscape character thus focuses on the *nature of the land*, rather than the response of a viewer.

Landscape Value – all encompassing (Aesthetic Value)

Aesthetic value is the emotional response derived from the experience of the environment with its particular natural and cultural attributes. The response can be either to visual or non-visual elements and can embrace sound, smell and any other factor having a strong impact on human thoughts, feelings and attitudes (Ramsay 1993). Thus aesthetic value encompasses more than the seen view, visual quality or scenery, and includes atmosphere, landscape character and sense of place (Schapper 1993).

Aesthetic appeal (value) is considered high when the following are present (Ramsay 1993):

- *Abstract qualities*: such as the presence of vivid, distinguished, uncommon or rare features or abstract attributes;
- *Evocative responses*: the ability of the landscape to evoke particularly strong responses in community members or visitors;
- *Meanings*: the existence of a long-standing special meaning to a particular group of people or the ability of the landscape to convey special meanings to viewers in general;
- *Landmark quality*: a particular feature that stands out and is recognised by the broader community.

Sense of Place

Central to the concept of a sense of place is that the place requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape together with the cultural transformations and traditions associated with historic use and habitation. According to Lynch (1992) sense of place "is the extent to which a person can recognize or recall a place as being distinct from other places - as having a vivid, or unique, or at least particular, character of its own". Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. In some cases these values allocated to the place are similar for a wide spectrum of users or viewers, giving the place a universally recognized and therefore, strong sense of place.

Scenic Quality

Assigning values to visual resources is a subjective process. The phrase, “beauty is in the eye of the beholder,” is often quoted to emphasize the subjectivity in determining scenic values. Yet, researchers have found consistent levels of agreement among individuals asked to evaluate visual quality.

Studies for perceptual psychology have shown human preference for landscapes with a higher visual complexity particularly in scenes with water, over homogeneous areas. On the basis of contemporary research landscape quality increases when:

- Topographic ruggedness and relative relief increase;
- Where water forms are present;
- Where diverse patterns of grasslands and trees occur;
- Where natural landscape increases and man-made landscape decreases;
- And where land use compatibility increases and land use edge diversity decreases (Crawford 1994).

Scenic Quality - Explanation of Rating Criteria:
(After The Visual Resource Management System, Department of the Interior of the USA Government, Bureau of Land Management)

Landform: Topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured. Outstanding landforms may be monumental, as the Fish River or Blyde River Canyon, the Drakensberg or other mountain ranges, or they may be exceedingly artistic and subtle as certain badlands, pinnacles, arches, and other extraordinary formations.

Vegetation: (Plant communities) Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular (wildflower displays in the Karoo regions). Consider also smaller scale vegetational features, which add striking and intriguing detail elements to the landscape (e.g., gnarled or wind beaten trees, and baobab trees).

Water: That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration in selecting the rating score.

Colour: Consider the overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) as they appear during seasons or periods of high use. Key factors to use when rating "colour" are variety, contrast, and harmony.

Adjacent Scenery: Degree to which scenery outside the scenery unit being rated enhances the overall impression of the scenery within the rating unit. The distance which adjacent scenery will influence scenery within the rating unit will normally range from 0-8 kilometres, depending upon the characteristics of the topography, the vegetative cover, and other such factors. This factor is generally applied to units which would normally rate very low in score, but the influence of the adjacent unit would enhance the visual quality and raise the score.

Scarcity: This factor provides an opportunity to give added importance to one or all 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.

Scenic Quality Inventory and Evaluation Chart

(After The Visual Resource Management System, Department of the Interior of the USA Government, Bureau of Land Management)

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

modifications	visual variety while promoting visual harmony. **2**	visual variety to the area, and introduce no discordant elements. **0**	variety but are very discordant and promote strong disharmony. **-4**

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

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

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

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

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

Appendix B
METHOD FOR DETERMINING THE MAGNITUDE (Intensity) OF LANDSCAPE AND VISUAL IMPACT

A visual impact study analysis addresses the importance of the inherent aesthetics of the landscape, the public value of viewing the natural landscape, and the contrast or change in the landscape from the project.

For some topics, such as water or air quality, it is possible to use measurable, technical international or national guidelines or legislative standards, against which potential effects can be assessed. The assessment of likely effects on a landscape resource and on visual amenity is more complex, since it is determined through a combination of quantitative and qualitative evaluations. (The Landscape Institute with the Institute of Environmental Management and Assessment, 2002).

Landscape impact assessment includes a combination of objective and subjective judgments, and it is therefore important that a structured and consistent approach is used. It is necessary to differentiate between judgments that involve a degree of subjective opinion (as in the assessment of landscape value) from those that are normally more objective and quantifiable (as in the determination of magnitude of change). Judgment should always be based on training and experience and be supported by clear evidence and reasoned argument. Accordingly, suitably qualified and experienced landscape professionals carry out landscape and visual impact assessments (The Landscape Institute with the Institute of Environmental Management and Assessment (2002).

Landscape and visual assessments are separate, although linked, procedures. The landscape baseline, its analysis and the assessment of landscape effects all contribute to the baseline for visual assessment studies. The assessment of the potential effect on the landscape is carried out as an effect on an environmental resource, i.e. the landscape. Visual effects are assessed as one of the interrelated effects on populations.

Landscape Impact

Landscape impacts derive from changes in the physical landscape, which may give rise to changes in its character and from effects to the scenic values of the landscape. This may in turn affect the perceived value ascribed to the landscape. The description and analysis of effects on a landscape resource relies on the adoption of certain basic principles about the positive (or beneficial) and negative (or adverse) effects of change in the landscape. Due to the inherently dynamic nature of the landscape, change arising from a development may not necessarily be significant (Institute of Environmental Assessment & The

Landscape Institute, 2002).

Visual Impact

Visual impacts relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity. Visual impact is therefore measured as the change to the existing visual environment (caused by the physical presence of a new development) and the extent to which that change compromises (negative impact) or enhances (positive impact) or maintains the visual quality of the area.

To assess the magnitude of visual impact four main factors are considered.

Visual Intrusion:

The nature of intrusion or contrast (physical characteristics) of a project component on the visual quality of the surrounding environment and its compatibility / discord with the landscape and surrounding land use.

Visibility:

The area / points from which project components will be visible.

Visual exposure:

Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion.

Sensitivity:

Sensitivity of visual receptors to the proposed development.

Visual Intrusion / contrast

Visual intrusion deals with the notion of contextualism i.e. how well does a project component fit into the ecological and cultural aesthetic of the landscape as a whole. Or conversely what is its contrast with the receiving environment. Combining landform / vegetation contrast with structure contrast derives overall visual intrusion / contrast levels of high, moderate, and low.

Landform / vegetation contrast is the change in vegetation cover and patterns that would result from construction activities. Landform contrast is the change in landforms, exposure of soils, potential for erosion scars, slumping, and other physical disturbances that would be noticed as uncharacteristic in the natural landscape. Structure contrast examines the compatibility of the proposed development with other structures in the landscape and the existing natural landscape. Structure contrast is typically strongest where there are no other structures (e.g., buildings, existing utilities) in the landscape setting.

Photographic panoramas from key viewpoints before and after development are presented to illustrate

the nature and change (contrast) to the landscape created by the proposed development. A computer simulation technique is employed to superimpose a graphic of the development onto the panorama. The extent to which the component fits or contrasts with the landscape setting can then be assessed using the following criteria.

- Does the physical development concept have a negative, positive or neutral effect on the quality of the landscape?
- Does the development enhance or contrast with the patterns or elements that define the structure of the landscape?
- Does the design of the project enhance and promote cultural continuity or does it disrupt it?

The consequence of the intrusion/contrast can then be measured in terms of the sensitivity of the affected landscape and visual resource given the criteria listed below. For instance, within an industrial area, a new sewage treatment works may have an insignificant landscape and visual impact; whereas in a *valued* landscape it might be considered to be an intrusive element. (Institute of Environmental Assessment & The landscape Institute, 1996).

Visual Intrusion

High	Moderate	Low	Positive
If the project: - Has a substantial negative effect on the visual quality of the landscape; - Contrasts dramatically with the patterns or elements that define the structure of the landscape; - Contrasts dramatically with land use, settlement or enclosure patterns; - Is unable to be 'absorbed' into the landscape.	If the project: - Has a moderate negative effect on the visual quality of the landscape; - Contrasts moderately with the patterns or elements that define the structure of the landscape; - Is partially compatible with land use, settlement or enclosure patterns. - Is partially 'absorbed' into the landscape.	If the project: - Has a minimal effect on the visual quality of the landscape; - Contrasts minimally with the patterns or elements that define the structure of the landscape; - Is mostly compatible with land use, settlement or enclosure patterns. - Is 'absorbed' into the landscape.	If the project: - Has a beneficial effect on the visual quality of the landscape; - Enhances the patterns or elements that define the structure of the landscape; - Is compatible with land use, settlement or enclosure patterns.

Result Notable change in landscape characteristics over an extensive area and / or intensive change over a localized area resulting in major changes in key views.	*Result* Moderate change in landscape characteristics over localized area resulting in a moderate change to key views.	*Result* Imperceptible change resulting in a minor change to key views.	*Result* Positive change in key views.

Visual intrusion also diminishes with scenes of higher complexity, as distance increases, the object becomes less of a focal point (more visual distraction), and the observer's attention is diverted by the complexity of the scene (Hull and Bishop, 1988).

Visibility

A viewshed analysis was carried out to define areas, which contain all possible observation sites from which the development would be visible. The basic assumption for preparing a viewshed analysis is that the observer eye height is 1.8m above ground level. Topographic data was captured for the site and its environs at 10m contour intervals to create the Digital Terrain Model (DTM). The DTM includes features such as vegetation, rivers, roads and nearby urban areas. These features were 'draped' over the topographic data to complete the model used to generate the viewshed analysis. It should be noted that viewshed analyses are not absolute indicators of the level of significance (magnitude) of the impact in the view, but merely a statement of the fact of potential visibility. The visibility of a development and its contribution to visual impact is predicted using the criteria listed below:

Visibility

High	Moderate	Low
Visual Receptors If the development is visible from over half the zone of potential influence, and / or views are mostly unobstructed and/or the majority of viewers are affected.	*Visual Receptors* If the development is visible from less than half the zone of potential influence, and / or views are partially obstructed and or many viewers are affected	*Visual Receptors* If the development is visible from less than a quarter of the zone of potential influence, and / or views are mostly obstructed and / or few viewers are affected.

Visual Exposure

Visual exposure relates directly to the distance of the view. It is a criterion used to account for the limiting effect of increased distance on visual impact. The impact of an object in the foreground (0 – 800m) is greater than the impact of that same object in the middle ground (800m – 5.0km) which, in turn is greater than the impact of the object in the background (greater than 5.0km) of a particular scene.

Distance from a viewer to a viewed object or area of the landscape influences how visual changes are perceived in the landscape. Generally, changes in form, line, colour, and texture in the landscape become less perceptible with increasing distance.

Areas seen from 0 to 800m are considered foreground; foliage and fine textural details of vegetation are normally perceptible within this zone.

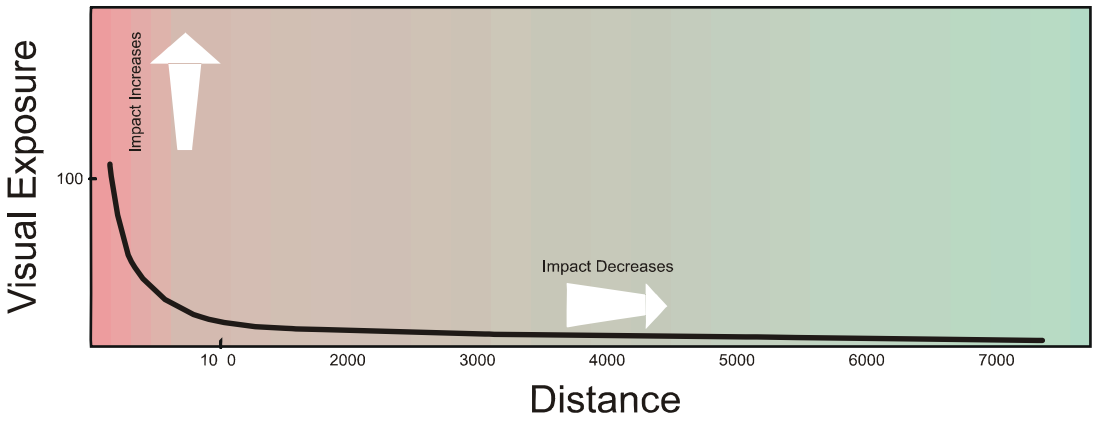
Areas seen from 800m to 5.0km are considered middle ground; vegetation appears as outlines or patterns. Depending on topography and vegetation, middle ground is sometimes considered to be up to 8.0km.

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

Seldom seen areas are those portions of the landscape that, due to topographic relief or vegetation, are screened from the viewpoint or are beyond 16km from the viewpoint. Landforms become the most dominant element at these distances.

The impact of an object diminishes at an exponential rate as the distance between the observer and the object increases. Thus, the visual impact at 1000m would be 25% of the impact as viewed from 500m. At 2000 m it would be 10% of the impact at 500m. The inverse relationship of distance and visual impact is well recognised in visual analysis literature (e.g. Hull and Bishop (1988)) and is used as important criteria for the study. This principle is illustrated in the figure below.

Effect of Distance on Visual Exposure



Sensitivity of Visual Receptors

When visual intrusion, visibility and visual exposure are incorporated, and qualified by sensitivity criteria (visual receptors) the magnitude of the impact of the development can be determined.

The sensitivity of visual receptors and views will be depended on:

- The location and context of the viewpoint;
- The expectations and occupation or activity of the receptor;
- The importance of the view (which may be determined with respect to its popularity or numbers of people affected, its appearance in guidebooks, on tourist maps, and in the facilities provided for its enjoyment and references to it in literature or art).

The most sensitive receptors may include:

- Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape;
- Communities where the development results in changes in the landscape setting or valued views enjoyed by the community;
- Occupiers of residential properties with views affected by the development.
- These would all be high (5)

Other receptors include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value); (3)
- People travelling through or past the affected landscape in cars, on trains or using other transport modes; (0)

- People at their place of work. (0)

The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view.

In this process more weight is usually given to changes in the view or visual amenity which are greater in scale and visible over a wide area. In assessing the effect on views, consideration should be given to the effectiveness of mitigation measures, particularly where planting is proposed for screening purposes (Institute of Environmental Assessment & The Landscape Institute (1996).

Sensitivity of Visual Receptors

High (5)	Moderate (3)	Low (0)
Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape; Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; Occupiers of residential properties with views affected by the development.	People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value); People travelling through or past the affected landscape in cars, on trains or other transport routes;	The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view (i.e. office and industrial areas). Roads going through urban and industrial areas

Magnitude (Intensity) of the Visual Impact

Potential visual impacts are determined by analysing how the physical change in the landscape, resulting from the introduction of a project, are viewed and perceived from sensitive viewpoints. Impacts to views are the highest when viewers are identified as being sensitive to change in the landscape, and their views are focused on and dominated by the change. Visual impacts occur when changes in the landscape are noticeable to viewers looking at the landscape from their homes or from parks, and conservation areas, highways and travel routes, and important cultural features and historic sites, especially in foreground views.

The magnitude of impact is assessed through a synthesis of visual intrusion, visibility, visual exposure and viewer sensitivity criteria. Once the magnitude of impact has been established this value is further qualified with spatial, duration and probability criteria to determine the *significance* of the visual impact.

For instance, the fact that visual intrusion and exposure diminishes significantly with distance does not necessarily imply that the relatively small impact that exists at greater distances is unimportant. The level of impact that people consider acceptable may be dependent upon the purpose they have in viewing the landscape. A particular development may be unacceptable to a hiker seeking a natural experience, or a household whose view is impaired, but may be barely noticed by a golfer concentrating on his game or a commuter trying to get to work on time (Ittleson *et al.,* 1974).

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

Magnitude (Intensity) of Visual Impact

High	Moderate	Low	Negligible
Total loss of or major alteration to key elements / features / characteristics of the baseline. I.e. Pre-development landscape or view and / or introduction of elements considered to be totally uncharacteristic when set within the attributes of the receiving landscape. High scenic quality impacts would result.	Partial loss of or alteration to key elements / features / characteristics of the baseline. I.e. Pre-development landscape or view and / or introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes of the receiving landscape. Moderate scenic quality impacts would result	Minor loss of or alteration to key elements / features / characteristics of the baseline. I.e. Pre-development landscape or view and / or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape. Low scenic quality impacts would result.	Very minor loss or alteration to key elements / features / characteristics of the baseline. I.e. Pre-development landscape or view and / or introduction of elements that are not uncharacteristic with the surrounding landscape – approximating the 'no change' situation. Negligible scenic quality impacts would result.

Cumulative effects

Cumulative landscape and visual effects (impacts) result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future. They may also affect the way in which the landscape is experienced. Cumulative effects may be positive or negative. Where they comprise a range of benefits, they may be considered to form part of the mitigation measures.

Cumulative effects can also arise from the intervisibility (visibility) of a range of developments and / or the combined effects of individual components of the proposed development occurring in different locations or over a period of time. The separate effects of such individual components or developments may not be significant, but together they may create an unacceptable degree of adverse effect on visual receptors within their combined visual envelopes. Intervisibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation and distance, as this affects visual acuity, which is also influenced by weather and light conditions. (Institute of Environmental Assessment and The Landscape Institute, 1996).

Appendix C
CRITERIA FOR SIGNIFICANCE OF IMPACT ASSESSMENT

The impact assessment methodology is based on the Hacking method of determination of the significance of impacts (Hacking, 1998). Part A provides the definition for determining impact consequence (combining severity, spatial scale and duration) and impact significance (the overall rating of the impact). Impact consequence and significance are determined from Part B and C. The interpretation of the impact significance is given in Part D.

PART A: DEFINITION AND CRITERIA*		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of severity, spatial extent and duration**
Criteria for ranking of the SEVERITY of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate / measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable / will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable / will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional / national

PART B: DETERMINING CONSEQUENCE

SEVERITY = L

DURATION	Long term	**H**	**Medium**	**Medium**	**Medium**
	Medium term	**M**	**Low**	**Low**	**Medium**

	Short term	**L**	**Low**	**Low**	**Medium**

SEVERITY = M

DURATION	Long term	**H**	**Medium**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Low**	**Medium**	**Medium**

SEVERITY = H

DURATION	Long term	**H**	**High**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Medium**	**Medium**	**High**
			L	**M**	**H**
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional / national
			SPATIAL SCALE		

PART C: DETERMINING SIGNIFICANCE					
PROBABILITY **(of exposure to impacts)**	Definite / Continuous	**H**	**Medium**	**Medium**	**High**
	Possible / frequent	**M**	**Medium**	**Medium**	**High**
	Unlikely / seldom	**L**	**Low**	**Low**	**Medium**
			L	**M**	**H**
			CONSEQUENCE		

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

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

Appendix D
CRITERIA FOR PHOTO / COMPUTER SIMULATION

To characterize the nature and magnitude of visual intrusion of the proposed project, a photographic simulation technique was used. This method was used according to Sheppard (in Lange 1994), where a visual simulation is good quality when the following five criteria are met.

Representativeness:	A simulation should represent important and typical views of a project.
Accuracy:	The similarity between a simulation and the reality after the project has been realized.
Visual clarity:	Detail, parts and overall contents have to be clearly recognizable.
Interest:	A simulation should hold the attention of the viewer.
Legitimacy:	A simulation is defensible if it can be shown how it was produced and to what degree it is accurate.

To comply with this standard it was decided to produce a stationary or static simulation (Van Dortmont in Lange, 1994), which shows the proposed development from a typical static observation points (Critical View Points).

Photographs are taken on site during a site visit with a manual focus, 50mm focal depth digital camera. All camera settings are recorded and the position of each panoramic view is recorded by means of a GPS. These positions, coordinates are then placed on the virtual landscape (see below).

A scale model of the proposal is built in virtual space, scale 1:1, based on CAD (vector) information as supplied by the architect / designers. This model is then placed on a virtual landscape, scale 1:1, as produced by means of GIS software. The accuracy of this depends on the contour intervals.

The camera views are placed on the points as recorded on the virtual landscape. The respective photographs are overlaid onto the camera views, and the orientation of the cameras adjusted accordingly. The light source is adjusted to suit the view. Each view is then rendered as per the process above.

Appendix E
VIEWSHED ANALYSIS

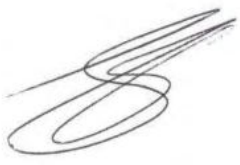
A Digital Terrain Model (DTM) was created by capturing current and most up to date topographic and land use data in digital format. Using the DTM, the programme performs a viewshed analysis on the lattice surface (a fine grid of cells extending over the entire study area). Each cell has stored information relating to x, y (plan) and z (height) co-ordinates. It computes a line of sight analysis across the current lattice from a selected vantage point in a 360 degree arc to define the area from which a vantage point may be seen.

Appendix F
DECLERATION OF INDEPENDENCE

Declaration of Independence

I, Graham A Young hereby declare that Newtown Landscape Architects cc, an independent consulting firm, has no interest or personal gains in this project whatsoever, except receiving fair payment for rendering an independent professional service.

Consultant name: Graham Young

Signature: 

Date: 11 October 2010

Appendix G
CURRICULUM VITAE

Since 1994

Graham Young PrLArch

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Graham is a landscape architect with thirty years experience. He has worked in Southern Africa and Canada and has valuable expertise in the practice of landscape architecture, urban design and environmental planning. He is also a senior lecturer, teaching urban design and landscape architecture at post and under graduate levels at the University of Pretoria. He also specializes in Visual Impact Assessments.

EXPERIENCE: **NEWTOWN LANDSCAPE ARCHITECTS cc.** ***Member***

Current — Responsible for project management, landscape design, urban design, and visual impact assessment.

Senior Lecturer: Department of Architecture, University of Pretoria.

1991 - 1994 **GRAHAM A YOUNG LANDSCAPE ARCHITECT** ***- Sole proprietor***

1988 - 1989 — Designed major transit and CBD based urban design schemes; designed commercial and recreational landscapes and a regional urban park; participated in inter-disciplinary consulting teams that produced master plans for various beachfront areas in KwaZulu Natal and a mountain resort in the Drakensberg.

1989 - 1991 **CANADA -** ***Free Lance***

Designed golf courses and carried out golf course feasibility studies (Robert Heaslip and Associates); developed landscape site plans and an end-use plan for an abandoned mine (du Toit, Allsopp and Hillier); conducted a visual analysis of a proposed landfill site. .

1980 - 1988 **KDM (FORMERLY DAMES AND MOORE)** - *Started as a Senior Landscape Architect and was appointed Partner in charge of Landscape Architecture and Environmental Planning in 1984*. Designed commercial, corporate and urban landscapes; completed landscape site plans; developed end-use master plans for urban parks, college and technikon sites; carried out ecological planning studies for factories, motorways and a railway line.

1978 - 1980 **DAYSON & DE VILLIERS -** ***Staff Landscape Architect***

Designed various caravan parks; designed a recreation complex for a public resort; conducted a visual analysis for the recreation planning of Pilgrims Rest; and designed and supervised the installation of various private gardens.

EDUCATION:

Bachelor of Landscape Architecture, 1978, (BLArch), University of Toronto, Canada;

Completing a master's degree in Landscape Architecture, University of Pretoria; Thesis: Visual Impact Assessment;

Senior Lecturer - Department of Architecture, University of Pretoria.

PROFESSIONAL:

Registered Landscape Architect – South African Council for Landscape Architectural Profession (2001);

Board of Control for Landscape Architects of South Africa (1987) – Vice Chairman 1988 to 1989;

Professional Member - Institute of Landscape Architects Southern Africa (1982) – President 1986 - 1988;

Member Planning Professions Board 1987 to 1989;

Member International Association of Impact Assessment;

AWARDS:

Torsanlorenzo International Prize, Landscape design and protection 2nd Prize Section B: Urban Green Spaces, for Intermediate Phase Freedom Park (2009)

Phase 1 and Intermediate Phase Freedom Park: Special Mention World Architecture Festival, Nature Category (2008)

Moroka Park Precinct, Soweto: ILASA Merit Award for Design (2005) and Gold Medal United Nations Liveable Communities (LivCom) Award (2007)

Isivivane, Freedom Park: ILASA Presidential Award of Excellence Design (2005)

Information Kiosk, Freedom Park: ILASA Merit Award for Design (2005)

Moroka – Mofola Open Space Framework, Soweto: ILASA Merit Award for Planning (2005)

Mpumalanga Provincial Government Complex: ILASA Presidential Award of Excellence (with KWP Landscape Architects for Design (2003)

Specialist Impact Report: Visual Environment, Sibaya Resort and Entertainment World: ILASA Merit Award for Environmental Planning (1999);

Gillooly's Farm, Bedfordview (with Dayson and DeVilliers): ILASA Merit Award for Design;

COMPETITIONS:

Pan African Parliament International Design competition – with MMA architects (2007) Finalist

Leeuwpan Regional Wetland Park for the Ekurhuleni Metro Municipality (2004) Landscape Architectural Consultant on Department of Trade and Industries Building (2002) – Finalist

Landscape Architecture Consultant on Project Phoenix Architectural Competition, Pretoria (1999): Winner;

Mpumalanga Legislature Buildings (1998): Commissioned;

Toyota Fountain (1985): First Prize - commissioned;

Bedfordview Bike/Walkway System - Van Buuren Road (1982): First Prize - commissioned;

Portland Cement Institute Display Park (1982): Second Prize

CONTRIBUTOR:

Joubert, O, 10 Years + *100 Buildings – Architecture in a Democratic South Africa Bell-Roberts Gallery and Publishing*, South Africa (2009)

- Freedom Park Phase 1 and Intermediate Phase (NBGM), Pretoria, Gauteng

Galindo, M, *Collection Landscape Architecture*, Braun, Switzerland (2009)

- Freedom Park Phase Intermediate Phase (NBGM), Pretoria, Gauteng

In *1000 X Landscapes*, Verlagshaus Braun, Germany (2008)

- Freedom Park Phase 1 and Intermediate Phase (NBGM), Pretoria, Gauteng
- Riverside Government Complex (NLAKWP), Nelspruit, Mpumalanga;
- Moroka Dam Parks Precinct, Soweto, Gauteng.

In *Johannesburg: Emerging/Diverging Metropolis*, Mendrision Academy Press, Italy (2007)

- Moroka Dam Parks Precinct, Soweto, Gauteng.

Since 1994

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B.Sc Degree in Environmental Science from the University of North West, Potchefstroom Campus (2003). M.Sc Degree in Ecological Remediation and Sustainable Utilization from the University of North West, Potchefstroom Campus (2007). She is currently employed by Newtown Landscape Architects working on the following projects.

EXPERIENCE: **Environmentalist: Newtown Landscape Architects**

Responsible for the environmental work, which includes Basic Assessments, Environmental Impact Assessments (Scoping & EIA), Environmental Management Plans (EMP), Environmental Auditing as well as Visual Impact Assessments.

Current Projects:

- **Orchards Extension 49-53,** Pretoria - Environmental Impact Assessment and Environmental Management Plan
- **Tanganani Ext 8,** Johannesburg - Environmental Impact Assessment and Environmental Management Plan
- **Diepsloot East Development,** Diepsloot **-** Environmental Impact Assessment and Environmental Management Plan
- **Klerksoord Ext 25 & 26,** Pretoria – Environmental Impact Assessment
- **Ennerdale Ext 16,** Johannesburg - Environmental Impact Assessment and Environmental Management Plan
- **Glen Marais Ext 102 & 103,** Kempton Park - Basic Assessment and Environmental Management Plan
- **Princess Plot 229,** Princess - Environmental Assessment (S24G Application)

- **Uthlanong Drive Upgrade** – Mogale City Local Municipalty project in Kagiso, Basic Assessment for the upgrade of the stormwater and the roads
- **Luipaardsvlei Landfill Site** – Mogale City Local Municipalty project in Krugersdorp, the expansion of the existing landfill site.
- **MCLM Waste Water Treatment Works** – Mogale City Local Municipalty project in Magaliesburg, the expansion of the existing facility.
- **Rand Uranium** (Golder Associates Africa (Pty) Ltd), Randfontein – VIA
- **Dorsfontein West Expansion** (GCS (Pty) Ltd), Kriel – VIA
- **Mine Waste Solutions** (GCS (Pty) Ltd), Stilfontein – VIA
- **Ferreira Coal Mining** (GCS (Pty) Ltd), Ermelo – VIA
- **De Wittekrans Mining** (GCS (Pty) Ltd), Hendrina – VIA

EDUCATION:

May 2009	Public Participation Course, International Association for Public Participation, Golder Midrand
May 2008	Wetland Training Course on Delineation, Legislation and Rehabilitation, University of Pretoria.
April 2008	Environmental Impact Assessment: NEMA Regulations – A practical approach, Centre for Environmental Management: University of North West.
Feb 2008	Effective Business Writing Skills, ISIMBI
Oct 2007	Short course in Geographic Information Systems (GIS), Planet GIS
Jan 2004 – April 2007	M.Sc Degree in Ecological Remediation and Sustainable Utilization, University of North West, Potchefstroom Campus. Thesis: Tree vitality along the urbanization gradient in Potchefstroom, South Africa.
Jan 2001 – Dec 2003	B.Sc Degree in Environmental Science, University of Potchefstroom

PROFESSIONAL REGISTRATION:

Sep 2009	Professional National Scientist – 400204/09

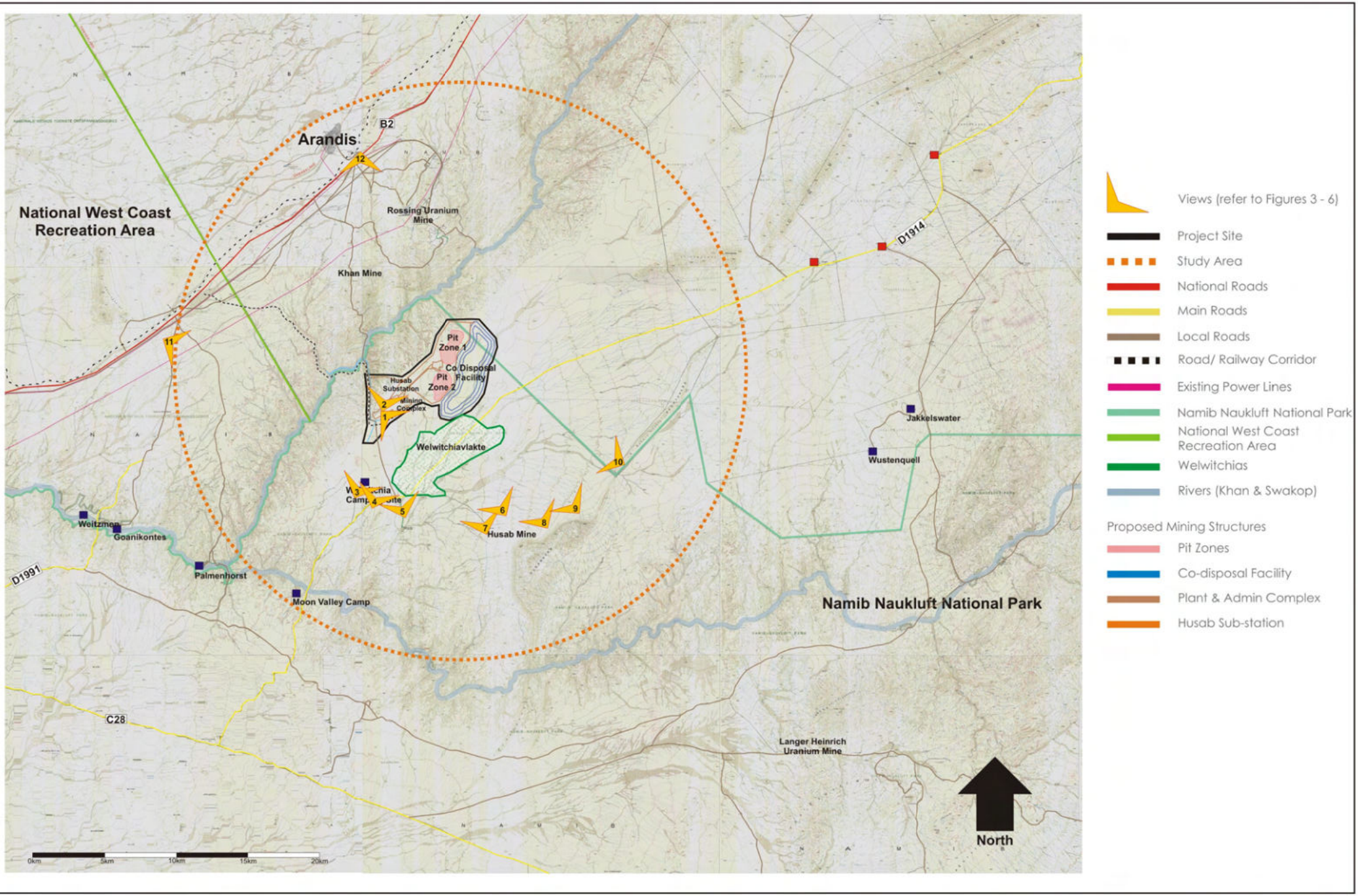

Figure 1: LOCALITY & VIEWS - Swakop Uranium Husab Project

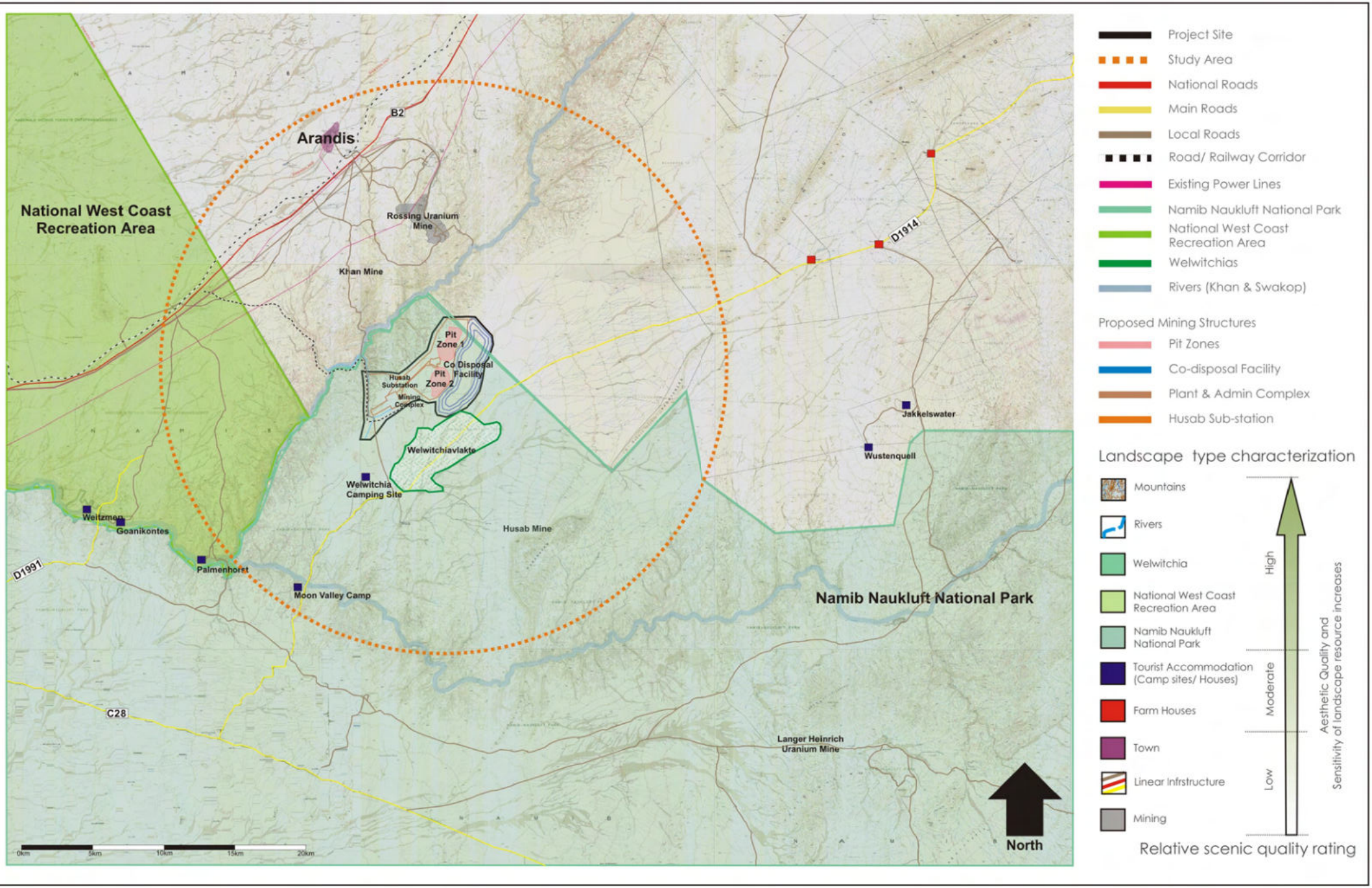

Figure 2: VISUAL RESOURCE - Swakop Uranium Husab Project

View 1: From Swakop Uranium Husab prospecting area towards the proposed study site

View 2: From Swakop Uranium Husab prospecting area towards the existing Rossing Uranium Mine Tailings Facility

View 3: From Welwitchia Camp Site, approximately 6km southwest of the proposed site

Refer to Figure 1 for the location of the views

Figure 3 : LANDSCAPE CHARACTER - Swakop Uranium Husab Project

View 4: From Welwitchia Vlakte, approximately 6km southwest of the proposed site

View 5: From Welwitchia Vlakte, approximately 6km southwest of the proposed site

View 6: From Husab Camp Site, approximately 4km south of the proposed site

Refer to Figure 1 for the location of the views

Figure 4 : LANDSCAPE CHARACTER - Swakop Uranium Husab Project

View 7: From local road, just before Husab Camp Site, approximately 6km southeast of the proposed site

View 8: From local road, just after the Husab Camp Site, approximately 6km southeast of the proposed site

View 9: From local road just after Husab Camp Site, approximately 6km southeast of the proposed site

Refer to Figure 1 for the location of the views

Figure 5 : LANDSCAPE CHARACTER - Swakop Uranium Husab Project

View 10: From local road, approximately 8km east of the proposed site

View 11: From the D4570 Road, approximately 16km west of the proposed site

View 12: From Road B2 (Arandis Turnoff), approximately 16km west of the proposed site

Refer to Figure 1 for the location of the views

Figure 6 : LANDSCAPE CHARACTER - Swakop Uranium Husab Project

Before

After

Night view

View 3: From Welwitchia Camp Site, approximately 6km southwest of the proposed site

Refer to Figure 1 for the location of the views

Figure 7 : SIMULATIONS - Swakop Uranium Husab Project

Before

After

View 4: From Welwitchia Vlakte, approximately 6km southwest of the proposed site

Refer to Figure 1 for the location of the views

Figure 8 : SIMULATIONS - Swakop Uranium Husab Project

Before

After

Mitigated

View 8: From local road, just after the Husab Camp Site, approximately 6km southeast of the proposed site

Refer to Figure 1 for the location of the views

Figure 9 : SIMULATIONS - Swakop Uranium Husab Project

Before

After

Night view

View 10: From local road, approximately 8km east of the proposed site

Refer to Figure 1 for the location of the views

Figure 10 : SIMULATIONS - Swakop Uranium Husab Project

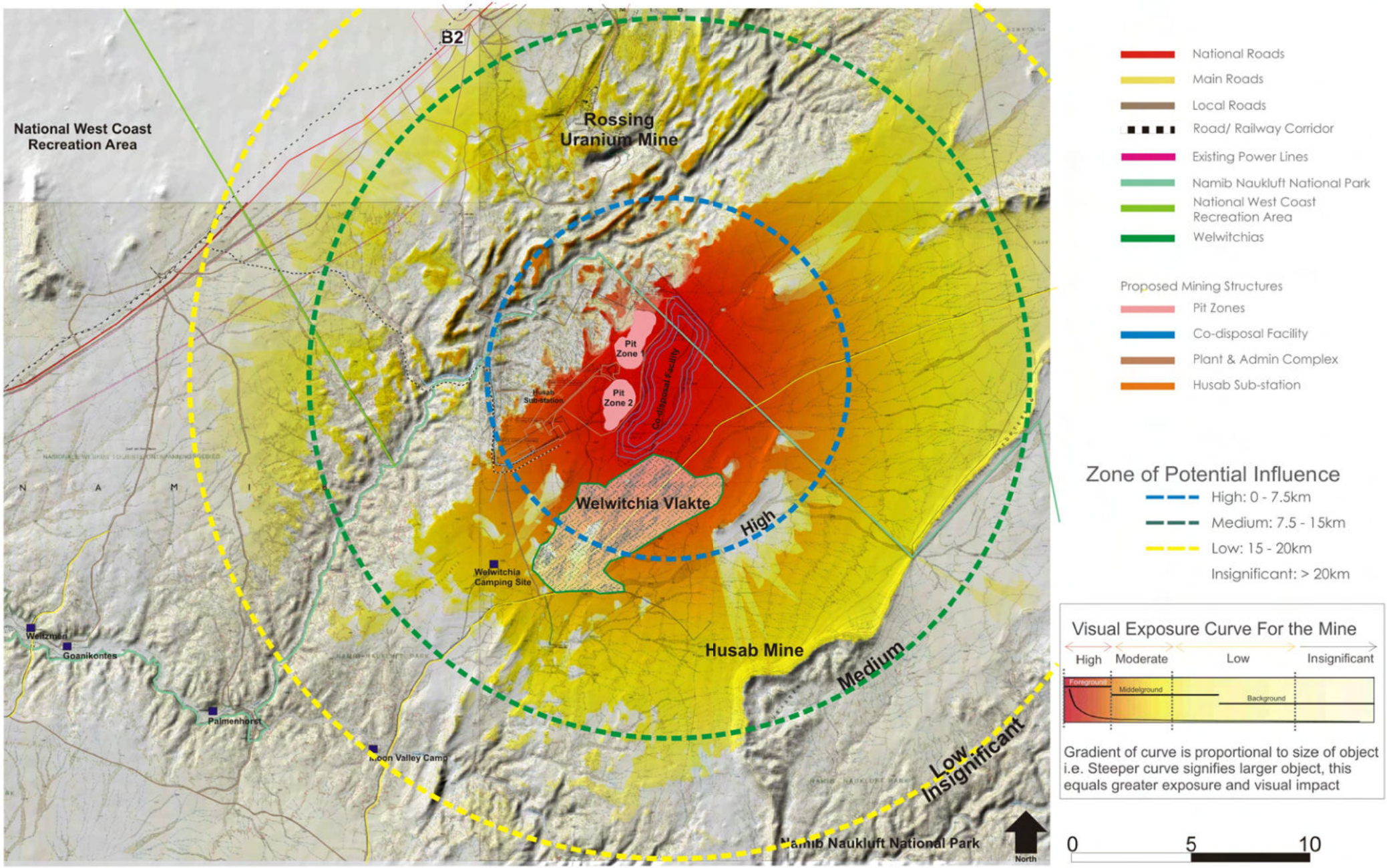

Figure 11: VIEWSHED - Swakop Uranium Husab Project: Co-Disposal Site (180m)