ENVIRONMENTAL IMPACT ASSESSMENT FOR RIO TINTO RÖSSING URANIUM LIMITED PROPOSED DESALINATION PLANT NEAR SWAKOPMUND

VISUAL IMPACT ASSESSMENT
SPECIALIST REPORT

DRAFT: 27 October 2014

Document prepared on behalf of:
Aurecon Namibia (Pty) Ltd
189 Newton Street
Windhoek
Namibia
7000
namibia@aurecongroup.com

Visual Resource Management Africa cc
P O Box 7233, George, 6531
Tel: +27 (44) 876 0020/ Fax: +27 (86) 653 3738
Cell: +27 (83) 560 9911
E-Mail: steve@vrma.co.za
Web: www.vrma.co.za

TABLE OF CONTENTS

TABLE OF FIGURES

LIST OF TABLES

GLOSSARY

Best Practicable Environmental Option (BPEO)

This is the option that provides the most benefit, or causes the least damage, to the environment as a whole, at a cost acceptable to society, in the long, as well as the short, term.

Cumulative Impact

The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Impact (visual)

A description of the effect of an aspect of a development on a specified component of the visual, aesthetic or scenic environment, within a defined time and space.

Issue (visual)

Issues are concerns related to the proposed development, generally phrased as questions, taking the form of "what will the impact of some activity be on some element of the visual, aesthetic or scenic environment?"

Key Observation Points (KOPs)

KOPs refer to receptors (people affected by the visual influence of a project) located in the most critical locations surrounding the landscape modification, who make consistent use of the views associated with the site where the landscape modifications are proposed. KOPs can either be a single point of view that an observer/evaluator uses to rate an area or panorama, or a linear view along a roadway, trail or river corridor.

Management Actions

Actions that enhance the benefits of a proposed development, or avoid, mitigate, restore or compensate for, negative impacts.

Receptors

Individuals, groups or communities who would be subject to the visual influence of a particular project.

Sense of Place

The unique quality or character of a place, whether natural, rural or urban.

Scenic Corridor

A linear geographic area that contains scenic resources, usually, but not necessarily, defined by a route.

Scoping

The process of determining the key issues, and the space and time boundaries, to be addressed in an environmental assessment.

Viewshed

The outer boundary defining a view catchment area, usually along crests and ridgelines. Similar to a watershed. This reflects the area in which, or the extent to which, the landscape modification is likely to be seen.

Zone of Visual Influence (ZVI)

The ZVI is defined as 'the area within which a proposed development may have an influence or effect on visual amenity.'

LIST OF ACRONYMS

APHP	Association of Professional Heritage Practitioners
BLM	Bureau of Land Management (United States)
BPEO	Best Practicable Environmental Option
CALP	Collaborative for Advanced Landscape Planning
DEA&DP	Department of Environmental Affairs and Development Planning (South Africa)
DEM	Digital Elevation Model
DoC	Degree of Contrast
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographic Information System
I&APs	Interested and Affected Parties
IDP	Infrastructure Development Plan
IEMA	Institute of Environmental Management and Assessment (United Kingdom)
IEMP	Integrated Environmental Management Plan
KOP	Key Observation Point
MET	Ministry of Environment and Tourism
MLA	Mine License Area
MME	Ministry of Mines and Energy
NNNP	Namib Naukluft National Park
MAMSL	Metres above mean sea level
NELPAG	New England Light Pollution Advisory Group
PSDF	Provincial Spatial Development Framework
ROD	Record of Decision
SAHRA	South African National Heritage Resources Agency
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
VRM	Visual Resource Management
ZVI	Zone of Visual Influence

This document was completed by Silver Solutions 887 cc trading as VRM Africa, a Visual Impact Study and Mapping organisation located in George, South Africa. VRM Africa cc was appointed as an independent professional visual impact practitioner to facilitate this VIA.

This document was undertaken by the following team:

Stephen Stead	Director/ Visual Impact	APHP accredited VIA Practitioner
Lisa Schultz	Editing and Contrast Rating	Bachelor of Arts, Fine Art

Stephen Stead

1 INTRODUCTION

VRM Africa was appointed by SLR Environmental Consulting (Namibia) (Pty) Limited (SLR) to undertake a Visual Impact Assessment (VIA) for the proposed Rio Tinto Rössing Uranium Desalination Plant. The site is located north of the town of Swakopmund, Namibia. A full site survey was undertaken on the 5th and 6th August 2014.

1.1 Terms of Reference

Landscape significance is assessed by differentiating between those landscapes of recognized or potential significance or sensitivity to modification and landscapes that have low sensitivity and scenic value. Different levels of scenic values require different degrees of management. For example, management of an area with high scenic value might be focused on preserving the existing character of the landscape, and management of an area with little scenic value might allow for major modifications to the landscape. Assessing scenic values and determining visual impacts can be a subjective process. Objectivity and consistency can be greatly increased by using standard assessment criteria to describe and evaluate landscapes, and to also describe proposed projects.' *(USA Bureau of Land Management. 2004)*.

The scope of the study is to cover the entire proposed project area, and the terms of reference for the study are as follows:

- Collate and analyse all available secondary data relevant to the affected proposed project area. This includes a site visit of the full site extent, as well as of areas where potential impacts may occur beyond the site boundaries.
- Consider all cumulative effects in all impact reports.
- Specific attention is to be given to the following:
  - Quantifying and assessing existing scenic resources/visual characteristics on, and around, the proposed site.
  - Evaluation and classification of the landscape in terms of sensitivity to a changing land use.
  - Determining viewsheds, view corridors and important viewpoints in order to assess the visual impacts of the proposed project.
  - Determining visual issues, including those identified in the public participation process.
  - Reviewing the legal framework that may have implications for visual/scenic resources.
  - Assessing the significance of potential visual impacts resulting from the proposed project for the construction, operation and decommissioning phases of the proposed project.
  - Assessing the potential cumulative impact associated with the visual impact.
  - Identifying possible mitigation measures to reduce negative visual impacts for inclusion into the proposed project design, including input into the Environmental Management Plan (EMP).

1.2 Assumptions and Limitations

- Information pertaining to the specific heights of activities proposed for the development was limited and, where required, generic heights will be used to define the visibility of the project.
- Although every effort to maintain accuracy was undertaken, as a result of the Digital Elevation Model (DEM) being generated from satellite imagery and not being a true representation of the earth's surface, the viewshed mapping is approximate and may not represent an exact visibility incidence
- The use of open source satellite imagery was utilised for base maps in the report.

- Some of the mapping in this document was created using Bing Maps (previously *Live Search Maps*, *Windows Live Maps*, *Windows Live Local*, and *MSN Virtual Earth*) and powered by the Enterprise framework
- The information for the terrain used in the 3D computer model on which the visibility analysis is based on is:
    - The Advanced Spaceborne Thermal Emission and Reflection (ASTER) Radiometer Data (ASTGTM_S2 3E014 and ASTGTM_S24E014 data set). ASTER GDEM is a product of Japan's Ministry of Economy, Trade and Industry (METI) and National Aeronautics and Space Administration (NASA) in USA. *(ASTER GDEM. METI / NASA. 2011)*
- Determining visual resources is a subjective process where absolute terms are not achievable. Evaluating a landscape's visual quality is complex, as assessment of the visual landscape applies mainly qualitative standards. Therefore, subjectivity cannot be excluded in the assessment procedure *(Lange 1994)*. The project deliverables, including electronic copies of reports, maps, data, shape files and photographs are based on the author's professional knowledge, as well as available information. This study is based on assessment techniques and investigations that are limited by time and budgetary constraints applicable to the type and level of assessment undertaken. VRM Africa reserves the right to modify aspects of the project deliverables if and when new/additional information may become available from research or further work in the applicable field of practice, or pertaining to this study.

2 PROJECT DESCRIPTION

The following description is based on the project information provided in the Gecko Water's Request for Quotation for EIA of 6 May 2014 and has been augmented by the various technical trade off studies conducted during the feasibility study, which is running in parallel to the Social and Environmental Impact Assessment process. It is possible that the project description will change to a lesser extent as the planning phase proceeds. This description should therefore be received as a conceptual plan. *(SLR/Aurecon. 2014)*

Six kilometres north of Swakopmund, the Swakopmund Salt Works has an existing water intake system that can be augmented by the new Desalination Plant. The figure on page 11 indicates the proposed location of the Rössing Uranium Desalination Plant within the existing Swakopmund Salt Works complex. The actual concept and plot plan layout remain to be finalized as part of the Feasibility Study. The desalination plant would use existing new water intake system and upgraded existing seawater channel to deliver water to a newly constructed pond, although other options were considered, these were found to be less attractive and will therefore not be considered as alternatives.

The site is located within the townlands and within the Swakopmund Salt Works mining license area. The "Facility" is divided into the following three major components: the Desalination Plant, the electrical supply route and substation, as well as the water supply route to RUL.

Desalination Plant

Comprising of all necessary systems, equipment, infrastructure and utilities to draw water from the ocean and produce product water at the required quality to a Water Product Tank on site. Three site localities for the desalination plant are being assessed, as shown in Figure 2 to follow. Site 1 is the preferred locality for the plant.

Water Receiving Tank/Pond and Pre-Treatment Plant

Good performance of the pre-treatment plant is essential to remove sediments, solids and organic matter.

Reverse Osmosis Plant

Key design criteria for the Reverse Osmosis plant include:

- The Plant operational utilization shall be at least 8,400 hours per year (>95% availability).
- All emissions will comply to World Bank Standards.
- The design should be able to accommodate the "Red Tide"-phenomena.
- The temperature of the generated brine from the RO plant is not to be more than meeting the discharge requirements by the World Bank Standard.
- As the corrosion potential along this coast is extremely high, this will have to be considered throughout the design.

The design of the RO facility will include:

- Preparing the terrain for the necessary structures.
- Foundations for the structures, whether buildings or containers.
- The road access will be via the existing Swakopmund Salt Works road.
- Electrical substation.

- Purified water pump station.

The footprint of the site will be approximately 200m x 400m or 8 ha.

As mentioned, three site localities are being assessed for the plant complex, as shown in Figure 2.

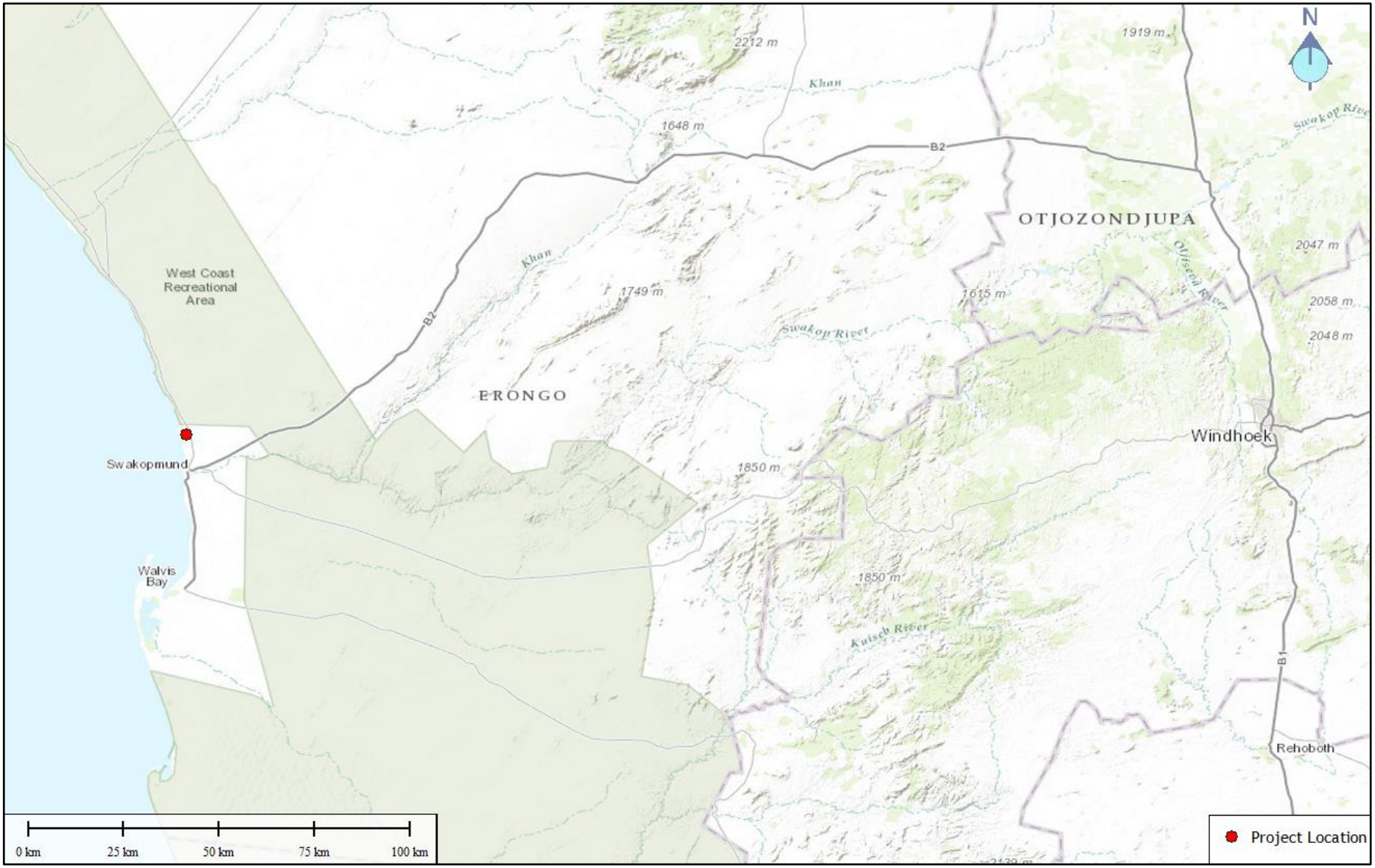


Figure 1: Proposed Project Regional Locality Map

Alternative 3

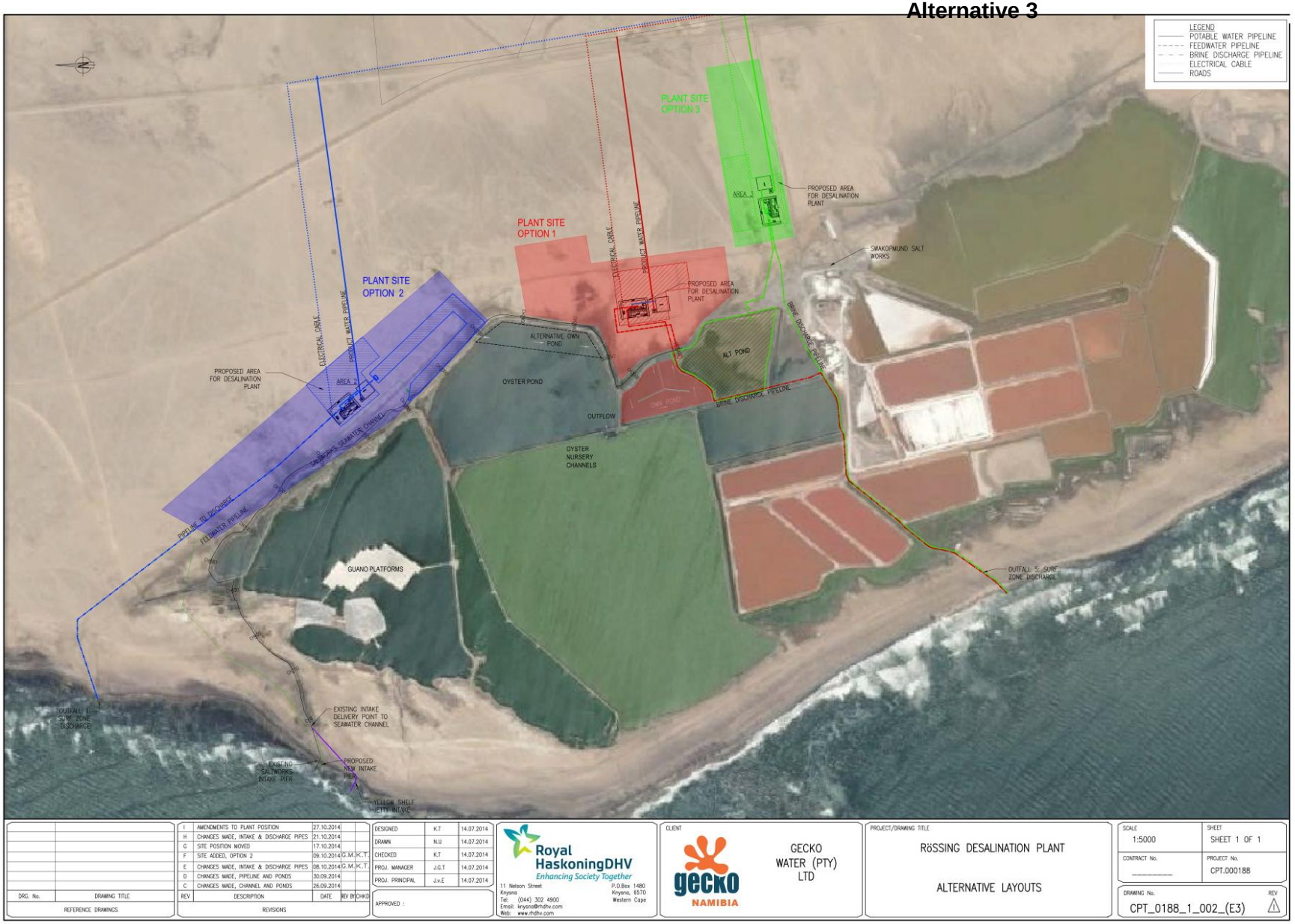


Figure 2: Proposed Project Development Plan *(SLR/Aurecon. 2014)*

Waste Discharge

The Swakopmund Salt Works currently disposes of brine at hyper saline quality (bitterns) on an intermittent basis (approximately 4 times per year for four consecutive days). The RO facility's brine will require ±15 MLD (TBC) to be discharged continuously. The preferred discharge site (Site 5) is situated just south of the existing salt works bitterns discharge site on a rock protrusion referred to as Yellow Shelf (Refer to SEIA for details). An alternative site is also being assessed (Site 1) which is the northern most site of the site options considered and is located at the existing, but now disused, Salt works concrete intake structure and pipeline.

The current plan is to discharge the wastewater directly into the surf zone below the low tide water level. Several other options were considered but found to be unfeasible on either financial or environmental grounds, and so no alternatives will be assessed in the SEIA for this project component.

Water Intake System

A direct open-water pipeline intake from a submerged inlet structure situated in the vicinity of the existing Swakopmund Salt Works intake is proposed for the Rössing Uranium desalination plant. The intake would be a jetty situated within the intertidal zone with vertical turbine pumps located a set-back distance from its seaward end. A short pipeline would discharge the water into the existing (to be upgraded) seatwork's seawater channel where it would gravitate around the salt works and enter into a new seawater intake pond, and from whence the desalination plant will abstract its seawater.

Numerous options have been considered, but none were found to offer a feasible alternative to that proposed above and so no alternatives for this component will be considered.

Pipeline and Pumps (on site)

The supply of the intake water will be by means of a pipeline and along the existing intake channel of the Swakopmund Salt Works. Using the existing Swakopmund Salt Works intake channel and new intake pond may have the benefit of settling out the suspended solids before entering the treatment plant, reducing the volume of pre-treatment chemicals and requirements. The NamWater pipeline is located about 850 m from the proposed Desalination Plant, into which the desalination plant will decant. Brine discharge pipeline will run from the plant to the discharge location (two sites are being assessed but site 5 near the existing Salt works bitterns discharge is currently the preferred option).

Electrical Supply

The nearby Tamarisk Substation (Located south of the desalination plant and just west of Swakopmund's northern suburbs) has capacity to provide at least 3 MW (required power). To connect to the Tamarisk Substation, a new 11 kV line of about 6 km would need to be constructed, together with a new substation at the new Rössing Desalination Plant. The transmission line will take the form of a buried cable for the entire route, although an alternative is being assessed which involves an overhead transmission line, using the existing transmission poles (cable has been stolen, but the poles remain), between the Tamarisk substation and the C34, east of the plant. From the point the cable would run underground.

Alternatives

As indicated on Figure 2 above, there are three proposed sites, Site 1 (preferred), Site 3 to the east of the preferred site adjacent the Salt Works access road, and Site 2 to the north adjacent to the existing salt pans. Two alternatives are proposed for the transmission line, over ground and underground along the same routing. Numerous project design and layout options were considered and these have been screened down through a series of trade-off studies to those that will be subjected to impact assessment. The social and environmental impact assessment will assess the impacts associated with each of the following alternatives:

- Preferred alternative - The preferred Alternative
- Alternative 1 – Desalination plant location No 2 (northern site) together with northern brine outfall;
- Alternative 2 – Desalination plant location No 3 (eastern site);
- Alternative 3 – Overhead powerline from Tamarisk substation along the C34 (using existing transmission poles), and buried cable to the plant; and
- Alternative 4 - The "No go" Alternative.

The plant location alternatives and the transmission line alternatives are likely to differ from a visual standpoint whereas the other alternatives mentioned above will have a negligible impact on overall visual impact and are therefore not assessed further (the impact assessment for preferred alternative will be deemed to apply). Similarly, in the "no go" alternative, the visual status quo will be maintained and is considered to have no impact and is not assessed further in this study.

2.1 Legislative Context

In order to comply with the Visual Resource Management requirements, it is necessary to clarify which planning policies govern the proposed property area to ensure that the scale, density and nature of activities or developments are harmonious and in keeping with the sense of place and character of the area. The proposed landscape modifications must be viewed in the context of the planning policies from the following organization guidelines:

International Finance Corporation (IFC)

The IFC prescribes eight performance standards (PS) on environmental and social sustainability. The first is to identify and evaluate the environmental and social risks and impacts of a project, as well as to avoid, minimise or compensate for any such impacts. Under PS 6, ecosystem services are organized into four categories, with visual/aesthetic benefits falling into the category of cultural services, which are the non-material benefits people obtain from ecosystems *(IFC. 2012).* This emotional enrichment that people experience and obtain from cultural ecosystems services is described by The Millennium Ecosystem Assessment, 2005, Ecosystems and Human Well-being: Synthesis report as follows: "Cultural ecosystems services: the non-material benefits that people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences." *(Millennium Ecosystem Assessment. 2005).*

Namibia Vision 2030

- Natural environments are disappearing fast. Consequently the solitude, silence and natural beauty that many areas in Namibia provide are becoming sought after commodities and must be regarded as valuable natural assets. Preserving these assets is fundamental to developing our tourism as a sustainable economic sector...Tourism has more potential as a sustainable industry

than virtually any other form of economic development in Namibia. *(Government of Namibia, Vision 2030, Pg 29)*

- Expansion of conservancy programme and wildlife habitats:
  Conservancies should cover many regions and established in all regions. As a consequence, wildlife (as an income generator and drawcard for tourism) will be more widely dispersed and supported throughout all of these regions. *(Government of Namibia, Vision 2030, Pg 78)*

Namibia's Environmental Management Act (EMA)

The purpose of Namibia's Environmental Management Act (EMA) is to "give effect to Article 95(l) and 91(c) of the Namibian Constitution:

- by establishing general principles for the management of the environment and natural resources;
- to promote the co-ordinated and integrated management of the environment;
- to give statutory effect to Namibia's Environmental Assessment Policy;
- to enable the Minister of Environment and Tourism to give effect to Namibia's obligations under international environmental conventions;
- to establish certain institutions in particular to provide for a Sustainable Development Commission and Environmental Commissioner".

Namibia Minerals Policy, Namibian Ministry of Mines and Energy

- Government must ensure that short to medium-term projects such as mining do not jeopardize the potential for long-term sustainable development in tourism. *(Minerals Policy of Namibia, Pg 13)*
- However, mining is also important to the national economy and this policy envisages controlled and justified prospecting and mining in these areas under conditions that will satisfy the protection of the environment. *(Minerals Policy of Namibia, Pg 13)*
- In order to reconcile the objectives of mineral exploitation and environmental protection, it is essential that the negative impacts of prospecting or mining activities on the environment be avoided, minimised and mitigated in accordance with national policy and legislation, and international best practice. *(Minerals Policy of Namibia, Pg 13)*
- While mining forms a very important part of the Namibian economy, it also has contributed to major environmental degradation. With respect to current and future operations, there is a need for appropriate legislation to regulate the environment in mining. *(Minerals Policy of Namibia, Pg 26)*

Rio Tinto Environmental and Sustainability Policies

- Wherever possible we prevent, or otherwise minimise, mitigate and remediate, harmful effects of the Group's operations on the environment. *(Rio Tinto Environmental Policy)*
- Excellence in environmental performance is essential to our business success. Compliance with all environmental laws and regulations is the foundation on which we build our environmental performance. *(Rio Tinto Environmental Policy)*
- Rio Tinto develops Group wide standards and builds systems to identify, assess and manage environmental risk... to achieve continuous improvement in environmental performance. *(Rio Tinto Environmental Policy)*
- Rio Tinto businesses, projects, operations and products should contribute constructively to the global transition to sustainable development.
- Rio Tinto contributes to sustainable development by helping to satisfy global and community needs and aspirations, whether economic, social or environmental. This means making

sustainable development considerations an integral part of our business plans and decision making processes. *(Rio Tinto Sustainability Policy)*

Rio Tinto Rössing Uranium Limited (RUL) Policies

In order to accomplish Rössing Uranium's vision and commitment to ... social responsibility and sustainability, Rössing Uranium will:

- commit to operate our business with respect and care for both the local and global environment in order to prevent and mitigate residual pollution
- be in full compliance with all applicable legislation, standards and requirements
- provide adequate training and resources to employees, contractors and visitors
- enhance biodiversity protection by assessing and considering ecological values and land-use aspects in investment, operational and closure activities *(Rössing Policy document www.Rössing .com)*

Uranium Rush Strategic Environmental Assessment (SEA)

In 2009, the Southern African Institute for Environmental Assessment (SAIEA) was contracted by the Government of the Republic of Namibia (GRN) to undertake a Strategic Environmental Assessment (SEA) for the so-called Central Namib 'Uranium Rush'. Some of their recommendations are listed below:

- 'The Erongo Uranium Rush presents significant opportunities for Namibia in terms of growth and development. However, in order to realise these benefits, all tiers of government, the mining companies and civil society (to a lesser extent) will have to overcome some major challenges and constraints. There are significant opportunities available to enhance the undoubted benefits of the Uranium Rush if the GRN has the political will and sufficient finances to implement all the necessary measures outlined in this Strategic Environmental Assessment (SEA) and Strategic Environmental Management Plan (SEMP).
- On the other hand, these benefits will come at a price – the Uranium Rush is partly located in a proclaimed national park and one of the most popular tourist hotspots in the country. Unless it is well managed and the necessary safeguards are in place, the Uranium Rush will negatively affect the environment – both at individual mine level and on a cumulative basis, which in turn will affect sense of place, tourism, lives and livelihoods. To ensure that the Uranium Rush has a positive influence on future development, the GRN, mining companies, local authorities and civil society must work together to eliminate, reduce or offset the negative impacts and enhance the benefits and synergies. For the Uranium Rush to leave a sustainable legacy, the recommendations made in the Strategic Environmental Management Plan (Chapter 8) must be successfully implemented.
- Most of the existing and proposed uranium mines are in, or adjacent to, national parks and protected areas. These areas are protected because of their special landscapes, biodiversity and heritage resources. While the Policy on Mining in Protected Areas allows mining and prospecting in Protected Areas, it is also possible in terms of the proposed Parks and Wildlife Management Bill of 2009, for MET and MME to agree to withdraw certain areas within parks from mining. One of the recommendations of this SEA is that certain biodiversity, tourism and heritage hotspots should be given Red Flag status and thus be permanently unavailable for mining and prospecting. This could limit the expansion of the uranium mines into certain areas in future, but at present there are numerous, extensive ore bodies which do not fall in the proposed Red Flag areas.
- The **natural beauty and ambience** of the desert will be compromised by the Uranium Rush because, even with the best environmental management plans in place, prospecting and mining will result in visually intrusive infrastructure, dust and noise, and will scar the Namib for decades,

or longer. At present, the largely undisturbed desert with its dramatic landscapes, interesting biodiversity and sense of place and space attracts numerous tourists every year.' *(SAIEA, 2010)*

The Uranium Rush Strategic Environmental Assessment (SEA) states that 'most of the existing and proposed uranium mines are in, or adjacent to, national parks and protected areas. These areas are protected because of their special landscapes, biodiversity and heritage resources. However, the Policy on Mining in Protected Areas allows mining and prospecting in Protected Areas'. One of the recommendations of the SEA is that certain biodiversity, tourism and heritage hotspots should be given Red Flag status and thus be permanently unavailable for mining and prospecting as they are unique areas of high importance for recreation that are not yet alienated by mining. The cumulative result of increased mining activity in the area would be that the '**natural beauty and ambience** of the desert will be compromised as prospecting and mining will result in visually intrusive infrastructure, dust and noise, and will scar the Namib for decades, or longer.'

DEA&DP Guideline for involving Visual and Aesthetic Specialists in EIA Processes

As specific Visual Guidelines are not provided for in Namibia, we have referred to the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for involving visual and aesthetic specialists in EIA processes.

The Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for involving visual and aesthetic specialists in EIA processes was referred to and states that the Best Practicable Environmental Option (BPEO) should address the following:

- Ensure that the scale, density and nature of activities or developments are harmonious and in keeping with the sense of place and character of the area. The BPEO must also ensure that development must be located to prevent structures from being a visual intrusion (i.e. to retain open views and vistas).
- "Long term protection of important scenic resources and heritage sites;
- Minimisation of visual intrusion in scenic areas;
- Retention of wilderness or special areas intact as far as possible;
- Responsiveness to the area's uniqueness, or sense of place."*(Oberholzer, B., 2005)*

3 METHODOLOGY SUMMARY

The process that VRM Africa follows when undertaking a VIA is based on the United States Bureau of Land Management's (BLM) Visual Resource Management method. This mapping and GIS-based method of assessing landscape modifications allows for increased objectivity and consistency by using standard assessment criteria. This involves the measurement of contrast in the form, line, texture and colour of the proposed landscape modification brought about by a proposed project, against the same elements found in the existing natural landscape (*BLM. USDI. 2004).* See Figure 3.

The first step in the VRM process is determining the existing and planned landscape context. A document review is undertaken to identify key plans for the area, and a regional landscape survey is undertaken to define the key landscape features and the visual resources. The landscape character of the proposed project site is then surveyed and mapped to identify areas of similar land use and landscape character. These areas are then rated using the VRM scenic quality criteria.

Individuals, groups or communities who would be subjected to the visual influence of a particular project are referred to as receptors and are identified early on in the VIA process by means of a viewshed analysis. Visual receptors are then screened against VRM receptor sensitivity criteria to define Key Observation Points (KOPs), which are the most significant locations where people or communities make consistent use of the views associated with the proposed site. Preliminary survey using Google Earth has identified tourist related activities in the area. The sensitivity of these points is assessed by applying VRM receptor sensitivity criteria.

The proposed project activities are then finally assessed from the KOPs around the site. Photo montages are generated to represent the expected change in the views as seen from each KOP. The degree of contrast in terms of line, colour, texture and form is measured to determine the extent to which the proposed project meets the Visual Resource Management objectives defined for the site. If contrast generated is high, mitigations and recommendations can be made to assist in meeting the visual objectives.

Please refer to the Appendix for detailed descriptions of the methodology.

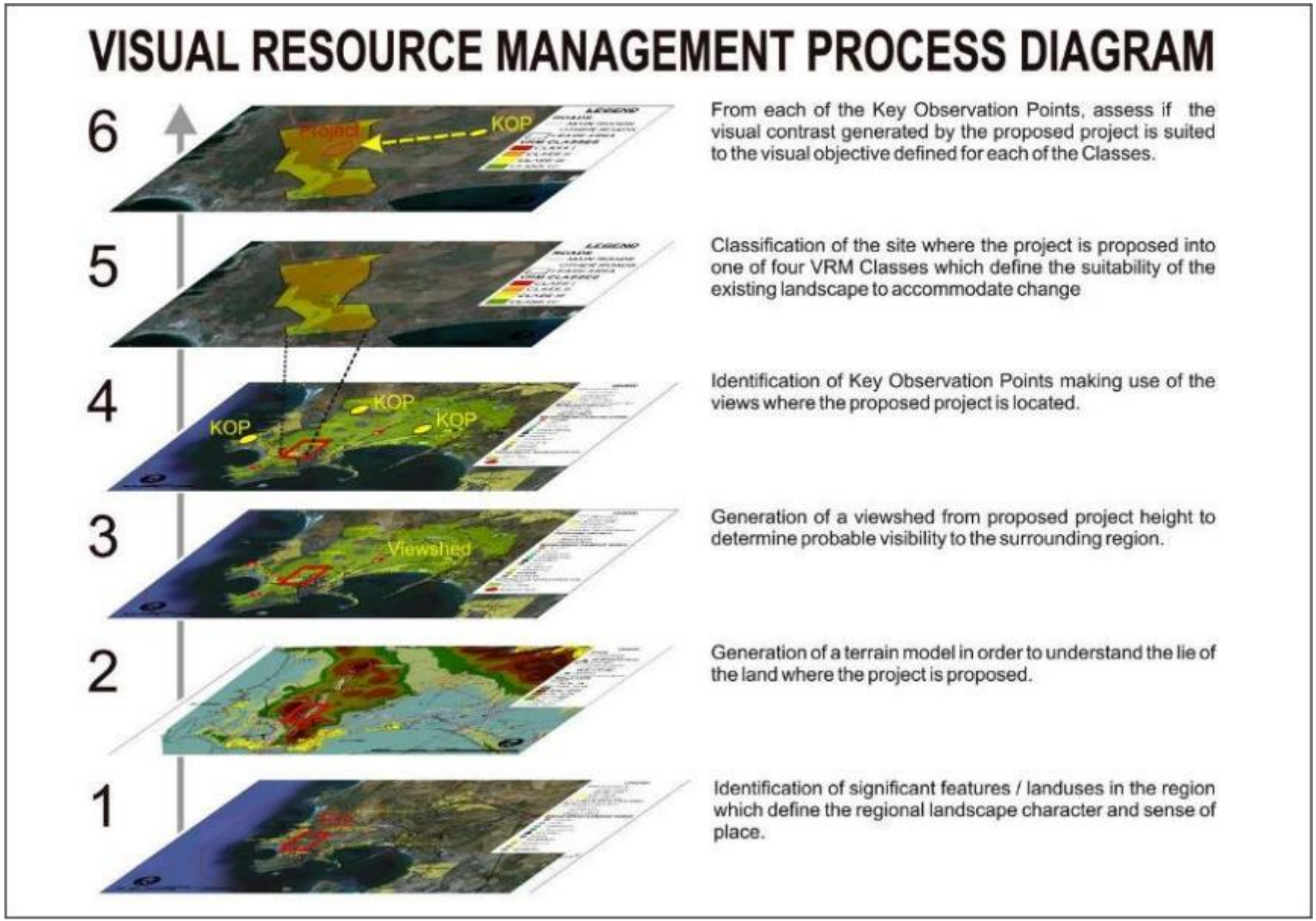


Figure 3: VRM process diagram

4 BASELINE ASSESSMENT

4.1 Project Visibility

The visible extent, or viewshed, is 'the outer boundary defining a view catchment area, usually along crests and ridgelines' *(Oberholzer, 2005).* This reflects the area, or extent, where a landscape modification of a specified height would probably be seen. In order to define the extent of the possible influence of the proposed project, a viewshed analysis is undertaken from the proposed sites at a specified height above ground level as indicated in the below table. The extent of the viewshed analysis was restricted to a defined distance that represents the approximate zone of visual influence (ZVI) of the proposed activities. The maps are informative only as visibility tends to diminish exponentially with distance, which is well recognised in visual analysis literature (*(Hull, R.B. and Bishop, I.E., 1988)*.

Table 1: Proposed Project Heights Table

Project Phase	Proposed Activity	Approx. Height (m)	Approx. ZVI (km)
Construction	Plant and Substation	3	6
Operation	Plant and Substation	6	6
Operation	Power line	20	2

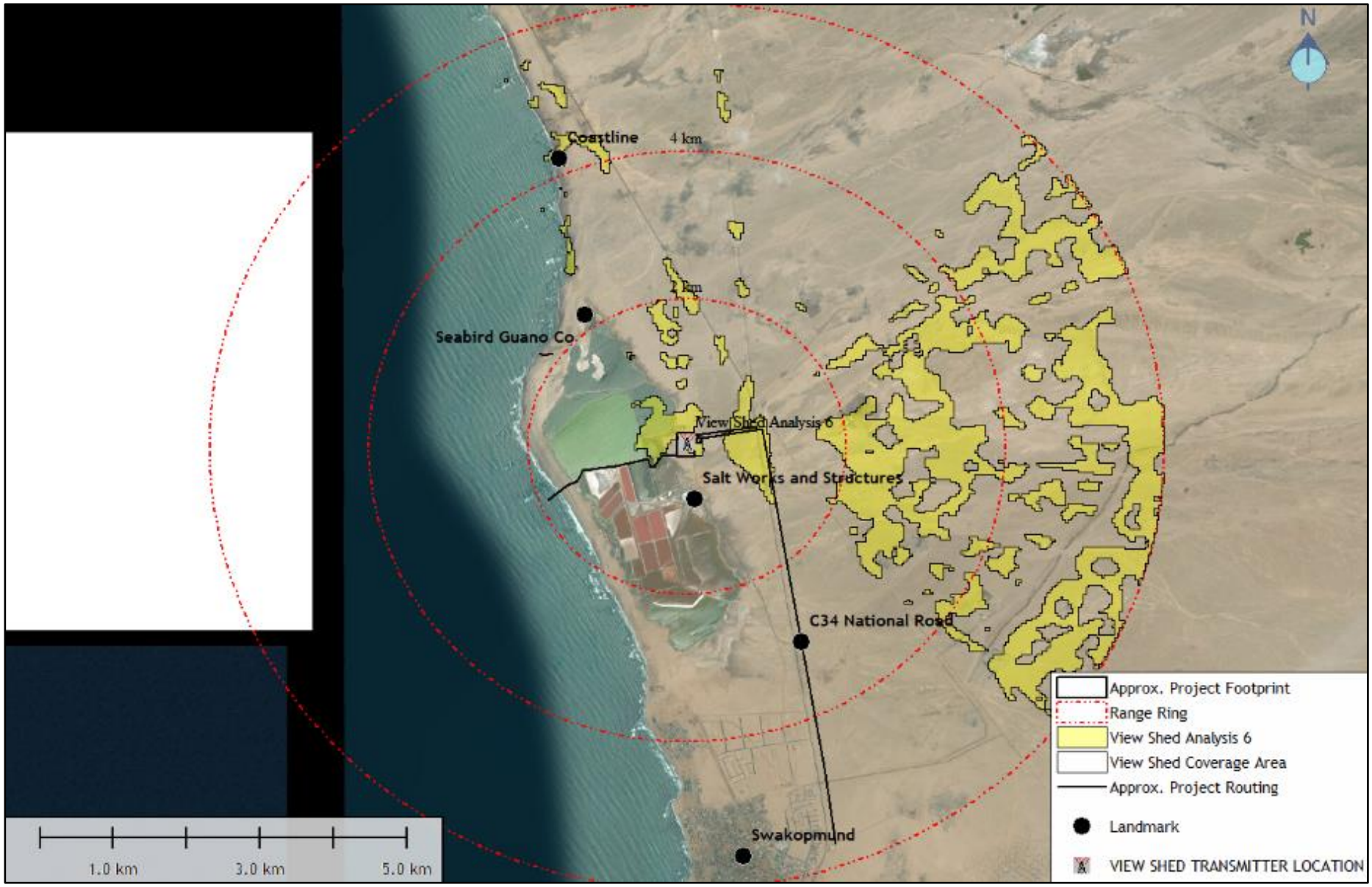


Figure 4: Viewshed of proposed plant and substation structures with a 3m height offset overlay onto Open Source Satellite Imagery Map

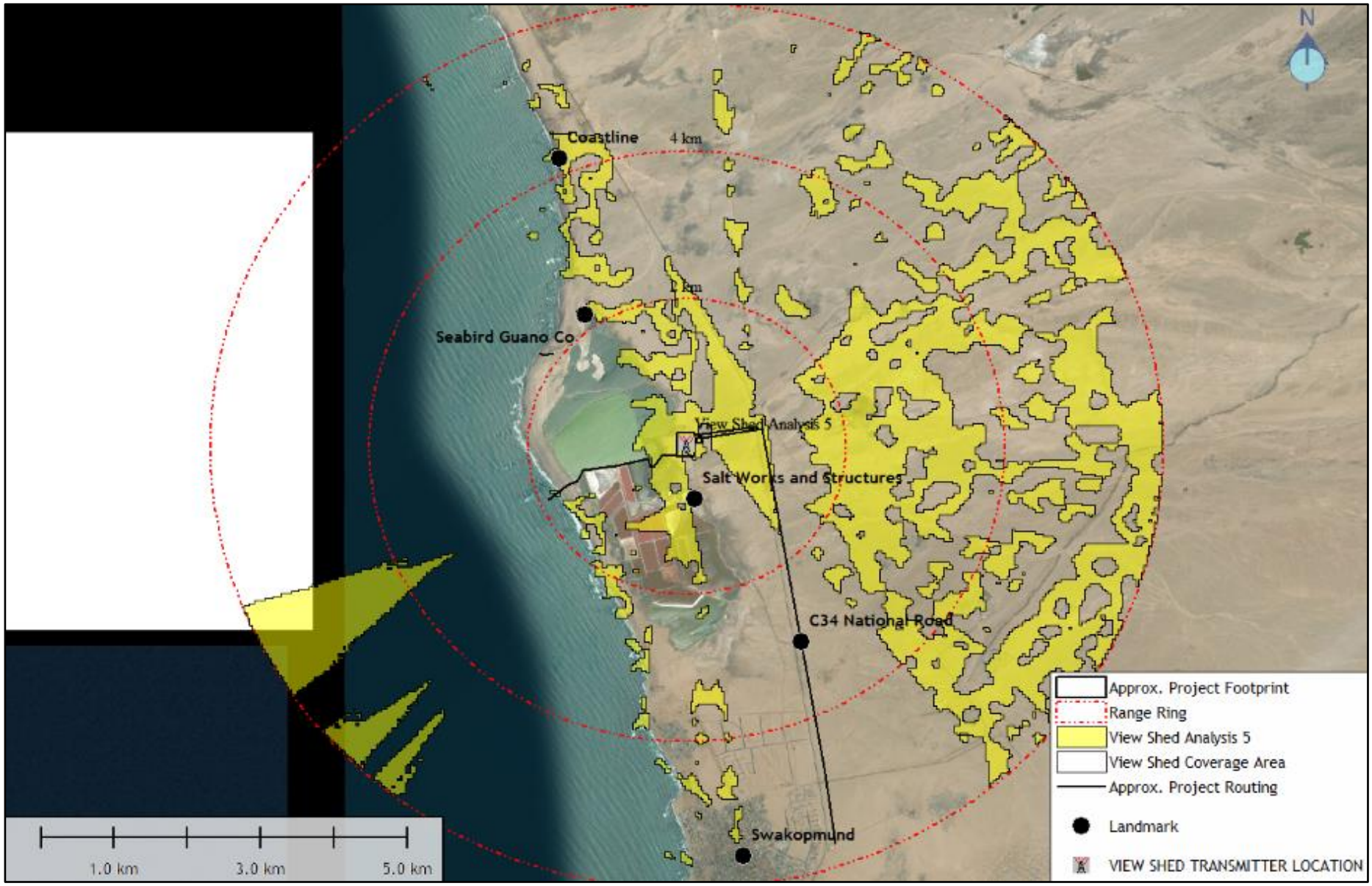


Figure 5: Viewshed of proposed plant and substation with a 6m height offset overlay onto Open Source Satellite Imagery Map

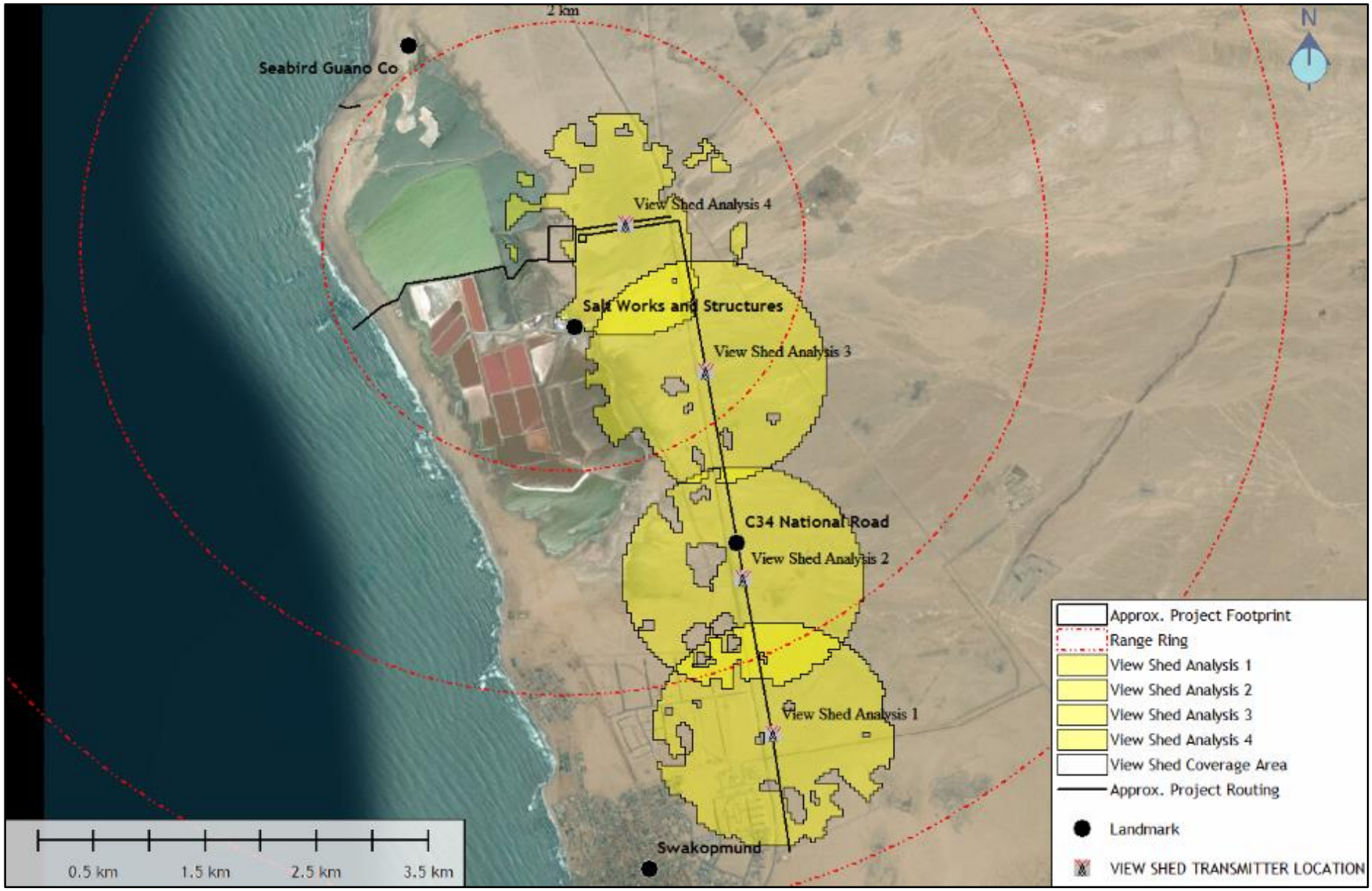


Figure 6: Viewshed of proposed transmission line with a 20m height offset overlay onto Open Source Satellite Imagery Map

4.2 Regional Landscape Character

Landscape character is defined by the U.K. Institute of Environmental Management and Assessment (IEMA) as the 'distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, land form, soils, vegetation, land use and human settlement'. It creates the specific sense of place or essential character and 'spirit of the place' *(Spon Press, 2002).* The following landmarks were identified as significant in defining the surrounding areas characteristic landscape:

- Swakopmund town
- C34 National Road
- Salt Company structures and works
- Seabird Guano Company and other Structures
- Atlantic Ocean coastline.

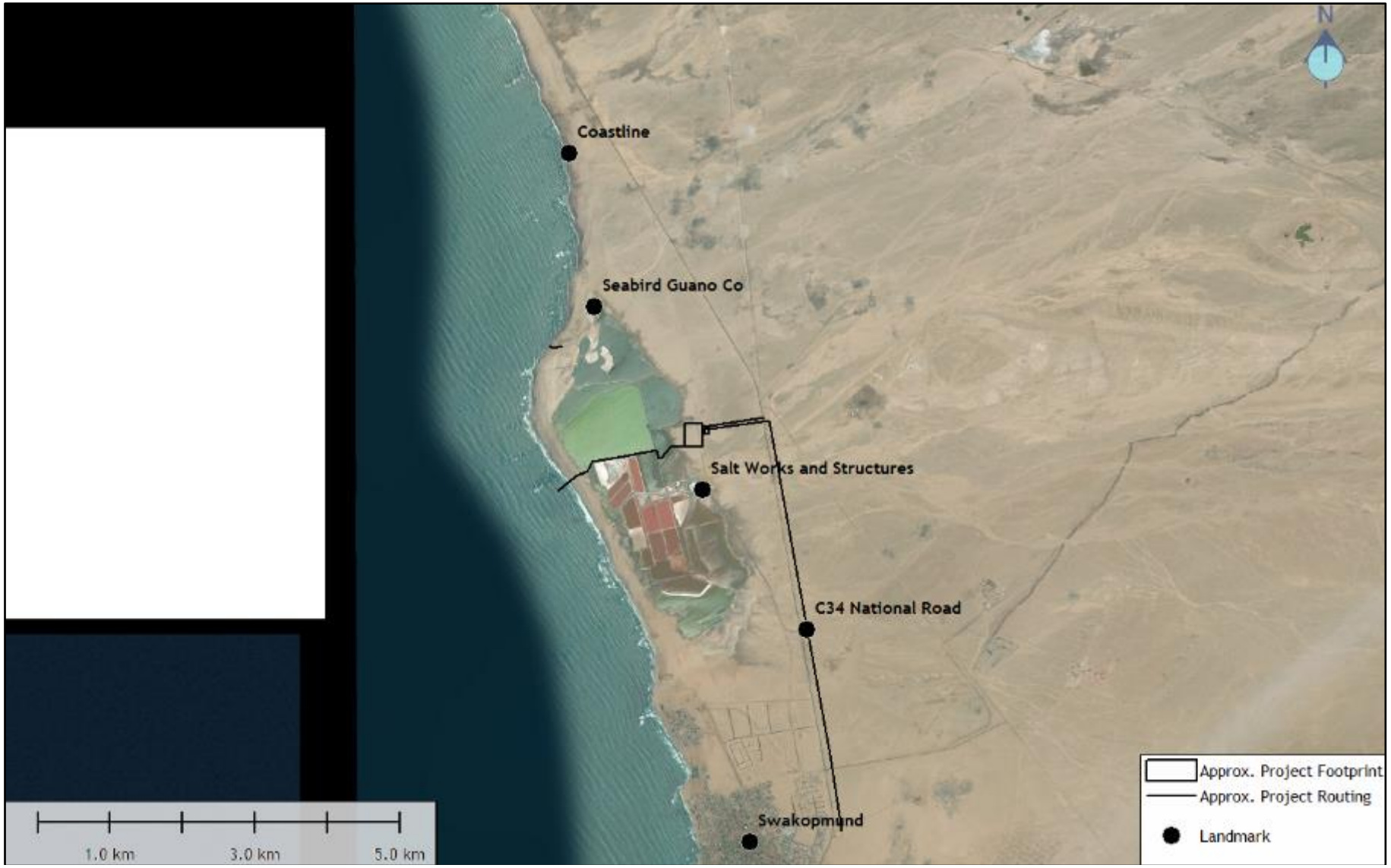


Figure 7: Landscape Context Photograph Points overlay onto Satellite Image

Swakopmund town

Figure 8: Panoramic photograph taken east towards Swakopmund town from the Jetty

Swakopmund lies on the B2 road and the Trans-Namib Railway from Windhoek to Walvis Bay. It is served by Swakopmund Airport and Swakopmund Railway Station. Visual significance of the town is increased due to the heritage of the town.

Swakopmund (German for "Mouth of the Swakop") was founded in 1892 as the main harbour for German South-West Africa. It is a medium sized town on the coast of western Namibia, and is the capital of the Erongo administrative district. The town has 42,000 inhabitants and covers 193 square kilometres (75 sq mi) of land. Swakopmund is an important beach resort and displays interesting examples of German colonial architecture. A sizable portion of its population is still German-speaking today which increases European tourism appeal. Wikipedia references indicated that buildings in the city include the Altes Gefängnis prison, designed by Heinrich Bause in 1909. The Woermannhaus, built in 1906 with a prominent tower, is now a public library. Attractions in Swakopmund include a Swakopmund Museum, the National Marine Aquarium, a crystal gallery and spectacular sand dunes near Langstrand south of the Swakop River.

Although sections of the town's residential area do fall within the viewshed (Figure 6) of the proposed plant and substation, it is most probably that only a few dwellings on the northern extents of the town would share ***low exposure*** views of the area where the landscape modification is proposed (once constructed). As depicted in Figure 7, it is likely that the proposed transmission lines from the existing NamPower substation to the plant would be clearly visible with ***high exposure*** from the north-eastern residential receptors. This area does have a higher visual absorption capacity due to the presence of the existing NamPower Substation and existing powerline infrastructure.
Due to the existing structures visible in the landscape as seen from the Swakopmund residential receptors, it is likely that their sensitivities to landscape modification would be ***moderate to low***.

C34 National Road

Figure 9: View southwards towards Swakopmund on the C34 National Road

The C34 is a salt road which links the towns of Swakopmund with the small fishing and tourist town of Henties Bay. The road follows the coastline northwards and in certain areas, the contrasting views of Atlantic Ocean to the west, and flat desert landscapes to the east create higher levels of scenic quality. This adds to the experience of the Namibian coastline sense of place. This route is utilised for the tourism activities which radiate out from Swakopmund and as such it is likely that tourist receptors utilising the road would have ***higher sensitivities*** to landscape change.

As indicated in the viewshed maps (Figures 6 & 7), the C34 falls within areas where ***high exposure*** views of both the plant / substation and the transmission line landscape modifications are possible. Within the area, the visual absorption capacity is increased by a precedent set by the cathodic corrosion protection lines of the buried NamPower pipeline, and from isolated structures associated with the Salt and Sea bird Guano company structures and works. There is also an isolated green coloured residential building (Figure 12) which dominates the attention of the casual observer due to strong colour contrast with the characteristic light grey-brown colours of the landscape.

Salt works and structures

Figure 10: Photograph depicting the existing Salt Company PTY LTD structures and salt stockpiles (above) and warehouse (below)

According to internet sources, the Salt Company was established in 1936 and comprises a series of ad hoc structures, a small light house replica, salt stockpiles and extensive evaporation pans required to obtain the salt. The area is an important birding destination due to birdlife being attracted to the large pans. New structures in this view shed may impact on these activities and the sense of place and will need to be considered in the impact assessment phase.

The older structures are painted a yellow colour which generates higher levels of colour contrast, but the more recent warehouse is a light grey-brown which significantly reduces the colour contrast. Although these receptors would have ***high exposure*** to the proposed site, it is likely that they would have ***low sensitivity*** to the landscape modifications due to the existing built landscape context and a working environment that is not associated with maintaining visual quality.

Seabird Guano Company and Other Structures

Figure 11: Photograph of the Guano Company structures (top) and the green house as seen from the C34 road

The Guano Company comprises of one medium sized administrative building and a large warehouse. Colours are muted and grey which reduces colour contrast and visual intrusion. The green coloured building contrasts strongly with the grey-browns of the characteristic landscape.

Atlantic Ocean Coastline

Figure 12: Photograph taken north of the existing Salt Company inlet structure

The coastline is an important tourist destination due to good coastal fishing with many camping sites located at defined 'Miles' from the town of Swakopmund. Recreational anglers driving along the coast would have ***low exposure*** to the proposed plant and substation, but would have ***high exposure*** views to any modifications proposed for the existing Salt Company Jetty. Although this is a tourist destination, due to the existing built precedent and lower levels of visual exposure (to the proposed plant) it is likely that receptors would have ***moderate sensitivity*** to landscape change. The intake structure, which comprises of a jetty, has the potential to create a significant, albeit local, visual intrusion and must will be considered during the SEIA phase.

4.3 Site Landscape Character

In terms of the VRM methodology, landscape character is derived from a combination of scenic quality, receptor sensitivity to landscape change, and distance of the proposed landscape modification. As part of the process of defining the VRM Classes, the site landscape character will need to be quantified using the VRM Scenic Quality and Receptor Sensitivity questionnaires (refer to addendum). A broad-brush assessment of the site topography was also undertaken making use of ASTER data Digital Elevation Model.

Topography

Due to the flat nature of the terrain, no terrain analysis was undertaken as the 90m resolution of the ASTER elevation data would not reflect the subtle changes of the desert landscape. In general, the terrain of the areas proposed for the plant, slopes gently down to the west, draining into the salt ponds to the west of the site (Refer to Figure 16). Due to the low elevation of the area, the roads have been slightly raised up and as such would afford wider views of the lower lying areas to the east and west.

Landscape Features

The following landscape features were identified on the site as depicted on the following maps:

- Survey Site 1 – Plant Alternative 1
- Survey Site 2 – Plant Alternative 2
- Survey Site 3 – Plant Alternative 3
- Survey Site 4 – Inlet Jetty
- Survey Site 5 – Transmission Line road crossing
- Survey Site 6 – Transmission Line.

Figure 13: Northern Landscape Character Survey Points Overlay onto Open Source Satellite Image Map

Figure 14: Southern Landscape Character Survey Points overlay onto Open Source Satellite Image Map

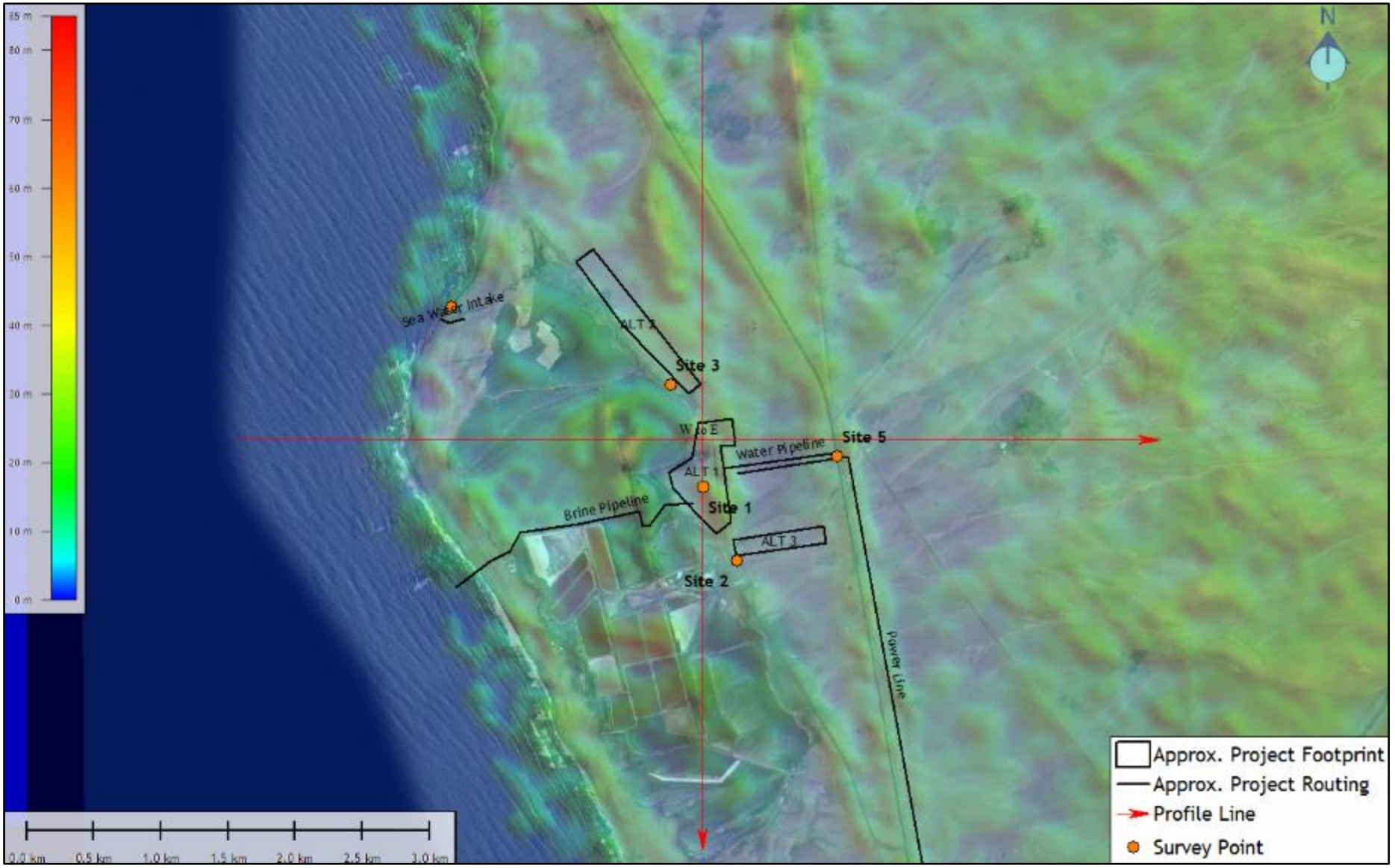


Figure 15: Broad brush elevation model and cross section profile locality map

Figure 16: Survey Site 1: View south from Alternative 1 with the Salt Works in the background

Figure 17: Survey Site 2: View south from Alternative 3 towards adjacent salt works

Figure 18: Survey Site 3: View north from Alternative 3 of the existing road and salt pans to the west

Figure 19: Survey Site 4: View west from the proposed intake point depicting the existing salt works intake structure.

Figure 20: Survey Site 5: View south from the proposed powerline road crossing with Swakopmund in the background.

Figure 21: Survey Site 6: View west from the proposed powerline route towards the Swakopmund north residential dwellings.

Table 2: Landuse, Visual Absorption Capacity, Prominence and Receptors Exposure Table

Map Ref	Proposed Activity	Broad Brush Landscapes	Landuse	Viewshed	Exposure	VAC	Zone of Visual Influence
1	Plant Alt 1	Modified desert sands	Industrial	Medium	Medium	High	Foreground / Middleground
2	Plant Alt 2	Modified desert sands	Industrial	Medium	Medium	High	Foreground / Middleground
3	Plant Alt 3	Modified desert sands	Industrial / recreational	Medium	Medium	Medium	Foreground / Middleground
4	Sea water intake	Coastline	Infrastructure	Medium	High	High	Foreground / Middleground
5	Transmission line North	Road	Infrastructure	Medium	High	Medium	Foreground / Middleground
6	Transmission line South	Urban	Residential	Medium	High	High	Foreground / Middleground
Summary	NA	NA	NA	Medium	Medium	Medium to high	Foreground / Middleground

Table 3: Scenic Quality Table

Map Ref	Proposed Activity	Landform	Vegetation	Water	Colour	Adj. Scenery	Scarcity	Cultural Modification	Total	Scenic Quality
1	Plant Alt 1	1	1	4	2	2	1	-2	9	C
2	Plant Alt 2	1	1	2	2	1	1	-2	6	C
3	Plant Alt 3	1	1	4	2	3	3	0	14	B
4	Sea water intake	1	1	5	2	3	3	-1	14	B
5	Transmission line North	1	1	2	2	2	1	0	9	C
6	Transmission line South	1	1	1	3	1	1	0	8	C
	AVG.	**1**	**1**	**4**	**2**	**2**	**1**	**-1**	**10**	**Medium to low**

(Key: A= scenic quality rating of ≥19; B = rating of 12 – 18, C= rating of ≤11)

Table 4: Receptor Sensitivity Table

Map Ref	Proposed Activity	Type Users	Amount of use	Public Interest	Adj. Land Users	Special Areas	Receptor Sensitivity
1	Plant Alt 1	Medium	Low	Medium	Low	Medium	Medium
2	Plant Alt 2	Medium	Low	Medium	Low	Medium	Medium
3	Plant Alt 3	High	Low	High	Low	Medium	High
4	Sea water intake	Medium	Low	Medium	Low	Low	Medium
5	Transmission line North	High	High	Medium	Low	Low	Medium
6	Transmission line South	High	High	Medium	Low	Low	Medium
		MH	**MH**	**M**	**ML**	**L**	**Medium to Low**

L = Low, M = Medium, H = High

5 RESULTS

5.1 VRM Findings

Visibility and Exposure

Due to the flat terrain of the desert landscape, the potential for an expanded viewshed is increased, mostly due to the absence of vegetative cover. Factors which decrease visibility are the sea mist which is often prevalent in this coastal environment, the slight undulation of the desert terrain as well as the higher visual absorption capacity generated by the existing structures of the salt works, the governmental house (green building) and the Guano factory. These create a strong precedent for isolated medium to large sized structures. Due to the higher VAC created by the structures, the higher visibility of the flat terrain is moderated and it is likely that the zone of visual influence of the proposed plant structures would be Moderate (Foreground and middle ground).

All of the proposed plant site alternatives are a similar distance (approx. 1km) from the Henties Bay road which is the main receptor corridor and exposure would be High. However, should the eastern section of site Alternative 3 be developed, the exposure to the road receptors would be Very High. The zone of visual influence of the proposed intake structure would likely be Moderate to Low as it is located adjacent to the existing Salt Works inlet jetty. The zone of visual influence of the proposed powerline is likely to be Moderate to High (less than one kilometre, if above ground) as there is already a precedent for some infrastructure along the route. If placed under the ground, once construction phase has been completed, it is likely that the landscape change would not be visible to the casual observer.

Scenic Quality

Of the six landscape points surveyed, the scenic quality ranged from Moderate to Low. Plant Alternatives 1 and 2 were rated Low with Plant Alternative 3 rated Moderate. The reason being that the areas further away from the Salt Works (Alternative 2) had higher ratings for 'adjacent scenery' as the open views of the pans were less dominated by the ad hoc structures and salt stock piles of the industrial context created by the salt works. In general, the uniformity of the desert landscape with limited undulation and vegetation reduced the scenic quality rating for all the proposed plant sites. All of the proposed plant sites have been modified by roads or by vehicle access to some degree.

Due to the close proximity to the coastline, with clear views of the Atlantic Ocean and the movement of the waves, the area where the intake is proposed has higher levels of scenic quality. The existing salt sea water intake is visually degraded and moderates the higher scenic qualities associated with the coastline.

The powerline is routed to the east of the Henties Bay road. The southern section of the road has existing high levels of visual contrast created by the northern extent of the Swakopmund residential areas and NamPower structures. Further to the north, the landscape changes to a more natural desert landscape, with a series of transmission poles (where the cable has been stolen) still dominating the attention of the casual observer. Due to the road and old transmission pole infrastructures, the area through which the powerline is proposed was rated Low for scenic quality.

Receptor Sensitivity to Landscape Change

As the town of Swakopmund is an important tourist destination associated with many landscape based tourist activities, it is likely that the overall sensitivity to landscape change would be Moderate. The fact that the proposed plant site alternatives are located adjacent to the salt pans, which are utilised for bird

watching activities, increases receptor sensitivity is expected. However, as there is already a precedent for larger isolated structures created by the Salt Co and Guano Co, it is likely that the proposed visual landscape change is possibly less of an issue than negative cumulative impacts onto the birding environment. The close proximity of Plant Alternatives 1 and 3 to the Salt Works would result in Moderate receptor sensitivity to landscape change at these locations. Plant Alternative 2 is located further north where the views of the Salt Works are less dominant. It is likely that receptor sensitivity to changes to the views of the salt pans would be experienced as High.

The area where the salt water intake is proposed was rated Moderate for receptor sensitivity. Although the area is adjacent the coastline which is utilised by those taking part in recreational fishing, an existing precedent for structures is created by the Salt Works jetty.

Due to the close proximity of the southern section of the proposed powerline to the Swakopmund residential areas, receptor sensitivity to the proposed powerline is likely to be higher. This effect would be moderated by the built nature of the area, the road as well as the NamPower substation structure. The existing NamPower cathodic protection poles adjacent the road enforces the visual perceptions of an infrastructure corridor, and the overall receptor sensitivity to landscape change along the powerline route was rated Moderate.

5.2 VRM Objectives and Contrast Rating

The VRM Classes represent the relative value of the visual resources of an area and are determined making use of the VRM Class Matrix see Table 2:

i. **Classes I and II** are the most valued;
ii. **Class III** represents a moderate value; and
iii. **Class IV** is of least value.

The Classes are not prescriptive and are utilised as a guideline to determine visual carrying capacity. The Visual Inventory Classes are defined using the matrix below and with motivation, can be adjusted to Visual Resource Management Classes:

Table 5: VRM Class Summary Table

Proposed Activity	Distance Category	Scenic Quality	Receptor Sensitivity	Visual Inventory	VRM Class
Plant Alt 1	Foreground	C	Medium	IV	III
Plant Alt 3	Foreground	C	Medium	IV	III
Plant Alt 2	Foreground	B	High	II	II
Sea water intake	Foreground	B	Medium	III	III
Transmission line North	Foreground	C	Medium	IV	III
Transmission line South	Foreground	C	Medium	IV	III
AVG.	**Foreground**	**Medium to Low**	**Medium**		

Class I

No Class I areas were defined within the study area as from a visual perspective; the existing landscape is not pristine and would not require for preservation of the landscape where very little visual contrast is allowed.

Class II

The landscape identified as having a VRM Class II visual objective was the proposed Plant Alternative 2. This was due to the area being further away from the Salt Works where the views and context was strongly associated with the salt pans. The visual objective is to retain the existing character the landscape and the level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract attention of the casual observer and should repeat the basic elements of form, line, colour and texture found in the predominant natural features of the characteristic landscape.

Class III

The landscapes identified as having a VRM Class III visual objective were those of the proposed Plant 1 and 3, the sea water intake and the northern section of the proposed power line. Due to close proximity to the industrial type node of the Salt Works, the Alternative 1 and 3 were rated low for scenic quality and receptor sensitivity. However, as the area is important as a birding destination were landscape quality is important, the Class IV grading was upgraded to Class III to allow for more landscape protection. The same VRM Class change was undertaken for the southern section of the proposed powerline as, although the area is degraded by the close proximity of the NamPower Substation structure and road infrastructure, the area is in close proximity to the northern Swakopmund residential areas and care should be taken not to set a negative precedent for infrastructure development adjacent residential areas and along the Henties Bay road. The area for the proposed salt water intake was rated VRM Class III due to moderate scenic qualities associated with the existing Salt Works jetty, but higher receptor sensitivities due to the close proximity to the coastline which is associated with recreational fishing. The Class III objective is to partially retain the existing character of the landscape, where the level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer, and changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV

No VRM Class IV areas were defined due to the higher sensitivities of the area in terms of tourism and bird watching.

6 IMPACT ASSESSMENT

Key Observation Points (KOPs) are defined by the Bureau of Land Management as the people (receptors) located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape modifications are proposed. These locations are important in terms of the VRM methodology which requires that the degree of contrast (Magnitude) that the proposed landscape modifications will make to the existing landscape is measured from these most critical locations, or receptors, surrounding the property. The Aurecon impact assessment criteria were utilised for the determination of visual impact significance.

To define the KOPs, potential receptor locations are identified in the viewshed analysis, which are screened, based on the following criteria:

- Angle of observation;
- Number of viewers;
- Length of time the project is in view;
- Relative project size;
- Season of use;
- Critical viewpoints, e.g. views from communities, road crossings; and
- Distance from property.

The following locations should be utilised to assess the degree of contrast as depicted in the following map:

- C34 southbound views towards the proposed transmission line road crossing;
- C34 northbound views towards the proposed plant and substation; and
- Swakopmund residential views towards the proposed transmission line.

Photomontages were generated to portray an illustrative representation of the proposed landscape modification. As the recommendation is that the existing Salt Works warehouse is utilised as a good example for design and colour, the existing Salt Works warehouse was utilised as the model in the following photomontage to portray the proposed structural landscape modifications. As indicated on the photographs, this is for ***illustrative purposed only.***

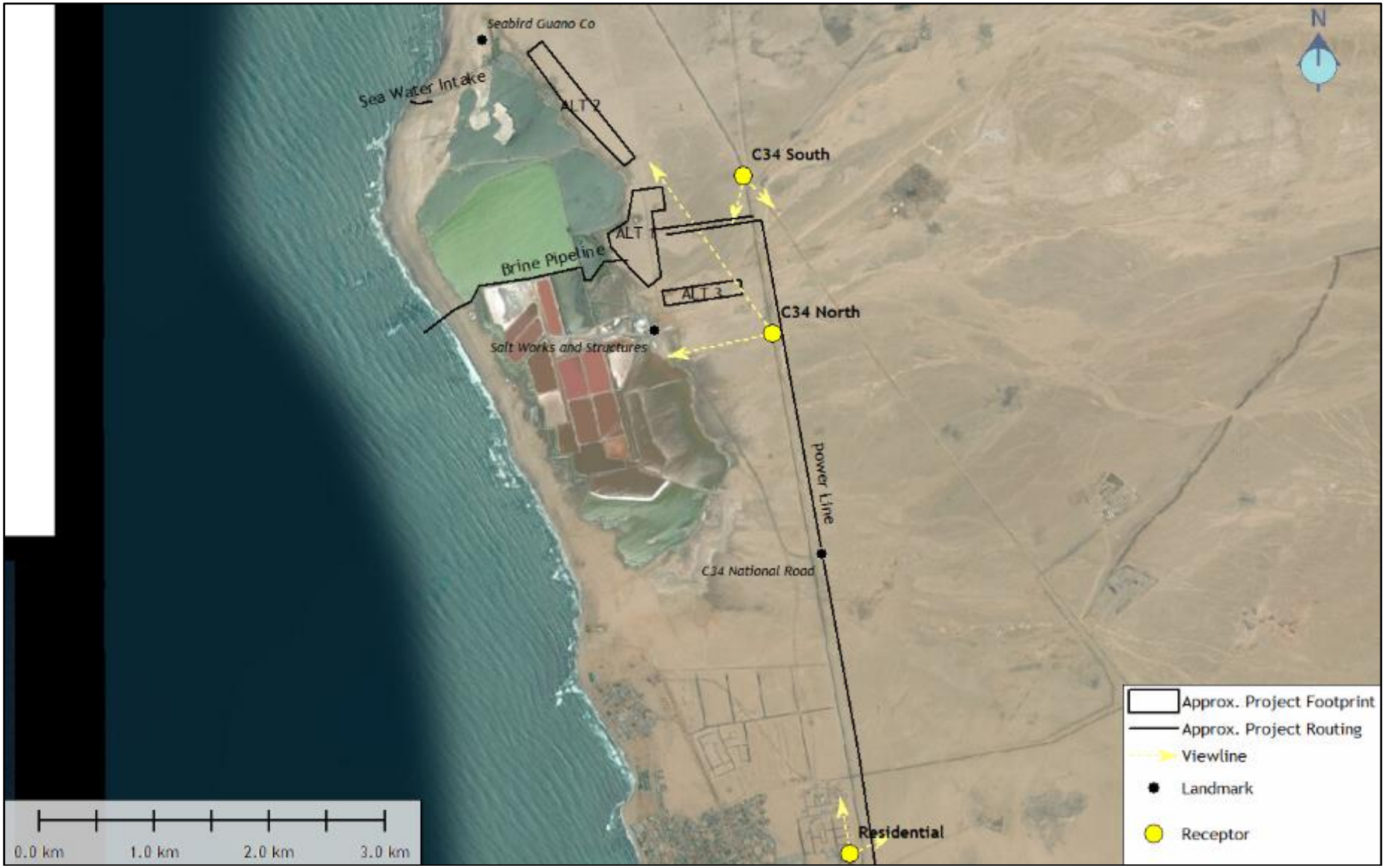


Figure 22: Key Observation Points overlaid onto Open Source Satellite Image Map

Initial view travelling north on the Henties Bay Road

Probable view of Plant Alternative 1 ***(FOR ILLUSTRATIVE PURPOSES ONLY)***

Figure 23: Existing and probable landscape change of Plant Alternative 1 as seen from travelling north on the Henties Bay Road

Initial view travelling north on the Henties Bay Road

Probable view of Plant Alternative 2 ***(FOR ILLUSTRATIVE PURPOSES ONLY)***

Figure 24: Existing and probable landscape change of Plant Alternative 2 as seen from travelling north on the Henties Bay Road

Initial view travelling north on the Henties Bay Road

Probable view of Plant Alternative 3 ***(FOR ILLUSTRATIVE PURPOSES ONLY)***

Figure 25: Existing and probable landscape change of Plant Alternative 3 as seen from travelling north on the Henties Bay Road

View of probable above ground routing as seen from the Henties Bay Road with Swakopmund in the background

View of probable above ground routing as seen from Swakopmund northern residential

Figure 26: Probable routings of the powerline as seen from Swakopmund north and the Henties Bay Road

Table 6: Landscape Character Environment Impacts Summary Table: Construction Phase

Impact Activity	Mitigation	Nature	Extent	Duration	Magnitude	Probability	Confidence	Reversibility	Significance without	Significance with mitigation	Mitigation
Plant Alternative 1	W/o	-ve	Loc	Short	M	P	Sure	Rev	MH		Create screening berm around the west and north perimeter to screen off base levels views of construction site. Locate the construction camp in closer proximity to the Salt Works. Fence off laydown to prevent wind-blown litter. No overhead flood lighting.
	With	-ve	Site	Short	L	P	Sure	Rev		ML	
Plant Alternative 3	W/o	-ve	Loc	Short	H	P	Sure	Rev	H		Create screening berm around the west and north perimeter to screen off base levels views of construction site. Fence off laydown to prevent wind-blown litter. No overhead flood lighting.
	With	-ve	Site	Short	M	P	Sure	Rev		M	
Plant Alternative 2	W/o	-ve	Loc	Short	L	P	Sure	Rev	H		Locate site closer to Salt Works (west side of site). Create screening berm around the west and north perimeter to screen off base levels views of construction site. Locate the construction camp in closer proximity to the Salt Works. Fence off laydown to prevent wind-blown litter. No overhead flood lighting.
	With	-ve	Site	Short	VL	P	Sure	Rev		L	
Intake Jetty	W/o	-ve	Loc	Short	H	P	Un-sure	Rev	H		Location of the construction camp away from the coastline out of the main views of the coastal receptors.
	With	-ve	Site	Short	M	P	Un-sure	Rev		MH	
Powerline (above ground)	W/o	-ve	Loc	Short	M	P	Sure	Rev	M		Hang cable on existing dis-used structures, or replace existing dis-used structures with new powerline structures, or place routing with a 20m buffer to the east of the existing routing of the cathodic corrosion protection poles. Access control (use same access point along route) and erosion control.
	With	-ve	Site	Short	M	P	Sure	Rev		M	
Powerline (underground)	W/o	-ve	Site	Short	M	P	Sure	Rev	L		Disturbed ground shaping to allow for natural run-off, rehabilitation and restoration.
	With	-ve	Site	Short	L	P	Sure	Rev		VL	
Cumulative Visual Impacts	W/o	-ve	Loc	Short	H	P	Un-sure	Rev	MH		Setting a plant construction precedent which maintains the existing tourism appeal for birders utilising the area. Setting a low intrusive precedent for powerline routing along tourist view corridors. Effect regional planning to ensure that the proposed development does not set a precedent for ribbon development along the coast.
	With	-ve	Site	Short	M	P	Un-sure	Rev		ML	

(Key: +ve = Positive, -ve = Negative, Reg = Regional, Perm = Permanent,
VL = Very Low, L = Low, M = Medium, H = High, P = Probable, HP = Highly Probable)

Table 7: Landscape Character Environment Impacts Summary Table: Operation

Impact Activity	Mitigation	Nature	Extent	Duration	Magnitude	Probability	Confidence	Reversibility	Significance without	Significance with mitigation	Mitigation
Plant Alternative 1	W/o	-ve	Reg	Long	MH	H	Sure	Rev	MH		Colour and building style to replicate colour and style of the new Salt Works building. Retain earth screening berm to reduce light spillage and no overhead flood lighting.
	With	-ve	Local	Long	ML	P	Sure	Rev		L	
Plant Alternative 3	W/o	-ve	Reg	Long	H	P	Sure	Rev	H		Colour and building style to replicate new Salt Works building. Retain earth screening berm to reduce light spillage and no overhead flood lighting.
	With	-ve	Local	Long	ML	P	Sure	Rev		M	
Plant Alternative 2	W/o	-ve	Reg	Long	H	P	Sure	Rev	H		Colour and building style to replicate colour and style of the new Salt Works building. Retain earth screening berm to reduce light spillage and no overhead flood lighting.
	With	-ve	Local	Long	MH	P	Sure	Rev		ML	
Intake Jetty	W/o	-ve	Local	Long	MH	P	Un-sure	Rev	MH		Design the new intake structure as close to the existing jetty as possible so that the two structures read as a single entity as seen by the casual observer. No signage. Structures to be painted desert-grey (ref to Salt Co new structure). No overhead flood lighting.
	With	-ve	Local	Long	M	H	Un-sure	Rev		M	
Powerline (above ground)	W/o	-ve	Reg	Long	H	H	Sure	Rev	H		Erosion control.
	With	-ve	Local	Long	M	P	Sure	Rev		M	
Powerline (underground)	W/o	-ve	Site	Long	L	P	Sure	Rev	L		Erosion control.
	With	-ve	Site	Long	VL	P	Sure	Rev		VL	
Cumulative Visual Impacts	W/o	-ve	Reg	Long	H	P	Un-sure	Rev	MH		Setting a plant development precedent which does not detract from the tourism appeal for birders utilising the area. Setting a low intrusive precedent for powerline routing along tourist view corridors. Effect regional planning to ensure that the proposed development does not set a precedent for ribbon development along the coast.
	With	-ve	Local	Long	M	H	Un-sure	Rev		ML	

(Key: +ve = Positive, -ve = Negative, Reg = Regional, Perm = Permanent,
VL = Very Low, L = Low, M = Medium, H = High, P = Probable, HP = Highly Probable)

Table 8: Landscape Character Environment Impacts Summary Table: Closure

Impact Activity	Mitigation	Nature	Extent	Duration	Magnitude	Probability	Confidence	Reversibility	Significance without	Significance with mitigation	Mitigation
Plant Alternative 1	W/o	-ve	Reg	Short	H	P	Sure	Rev	H		Deconstruction of all structures, ground shaping to reflect natural terrain, rehabilitation and restoration.
	With	-ve	Local	Short	VL	P	Sure	Rev		VL	
Plant Alternative 3	W/o	-ve	Reg	Short	H	P	Sure	Rev	H		Deconstruction of all structures, ground shaping to reflect natural terrain, rehabilitation and restoration.
	With	-ve	Local	Short	VL	P	Sure	Rev		VL	
Plant Alternative 2	W/o	-ve	Reg	Short	H	P	Sure	Rev	H		Deconstruction of all structures, ground shaping to reflect natural terrain, rehabilitation and restoration.
	With	-ve	Local	Short	VL	P	Sure	Rev		VL	
Intake Jetty	W/o	-ve	Local	Short	H	P	Un-sure	Rev	H		Deconstruction of all structures.
	With	-ve	Local	Short	VL	P	Un-sure	Rev		VL	
Powerline (above ground)	W/o	-ve	Reg	Short	H	P	Sure	Rev	H		Deconstruction of all structures, ground shaping to reflect natural terrain, rehabilitation and restoration.
	With	-ve	Local	Short	VL	P	Sure	Rev		VL	
Powerline (underground)	W/o	-ve	Site	Short	L	P	Sure	Rev	VL		Ground shaping to reflect nature terrain, rehabilitation and restoration (if the cable is to be dug up).
	With	-ve	Site	Short	VL	P	Sure	Rev		VL	
Cumulative Visual Impacts	W/o	-ve	Reg	Short	H	P	Un-sure	Rev	H		Setting a positive precedent for effective rehabilitation and restoration in a tourist related landscape. Effect regional planning to ensure that the proposed development does not set a precedent for ribbon development along the coast.
	With	-ve	Local	Short	VL	P	Un-sure	Rev		VL	

(Key: +ve = Positive, -ve = Negative, Reg = Regional, Perm = Permanent,
VL = Very Low, L = Low, M = Medium, H = High, P = Probable, HP = Highly Probable)

6.1 Impact Descriptions and Mitigations

Desalinisation Plant Alternative 1

Construction phase impacts without mitigation are likely to be Moderate to High. The landscape modification as seen from the Henties Bay road viewers would be moderated by the distance to the site, and the lower elevation of the site in relation to the road which offers some base levels topographic screening. The site is also in the vicinity of the existing Salt Works which increases the regional Visual Absorption Capacity levels. Higher visual intrusion would be experienced by bird watchers due to the closer proximity of the proposed site to the pans. With mitigation, the construction phase impacts could be reduced to Moderate to Low. Mitigations proposed to reduce the visual intrusion to the birders is to level the site such that a two metre high berm can be created to the pan side of the site to screen off base level vehicle movements and construction activities. It is also recommended that the laydown is located to the south in closer visual proximity to the Salt Works. Once the final footprint of the plant is defined, a qualified landscape architect should be contracted to assist in the design of the screening berm to ensure that it appears to tie into the natural landscape as seen from the pans.

Operation phase impacts without mitigation would be High if bright colours were utilised for the walls which would generate strong colour contrast as seen from the Henties Bay road as well as the birders. With mitigation in terms of colour and simple, lower profile design of the structures (similar to the Salt Works warehouse design), the construction phase impacts can be reduced to Low. It is recommended that overhead flood lighting is not utilised.

Closure phase visual impacts have the potential to remain High if the structures are not removed should the project come to an end. The structures would create a sense of landscape decay which is not currently prevalent. Should the structures be removed and the modified areas shaped to allow for natural ground-water run-off, the Closure Phase visual impacts would be Very Low.

Desalinisation Plant Alternative 2

Construction phase impacts without mitigation have the potential to be High. Due to the location of this Alternative in visual isolation from the existing structures (two kilometres north of the existing Salt Works and one kilometres from the Guano Co), the Visual Absorption Capacity levels levels are low. Higher visual intrusion would be experienced by bird watchers due to the close proximity of the proposed site to the pans. With mitigation, the construction phase impacts could be reduced to Moderate. Mitigations proposed to reduce the visual intrusion to the birders is to level the site such that a two metre high berm can be created to the pan side of the site to screen off base level vehicle movements and construction activities. Once the final footprint of the plant is defined, a qualified landscape architect should be contracted to assist in the design of the screening berm to ensure that it appears to tie into the natural landscape as seen from the pans.

Operation phase impacts without mitigation would be High if bright colours were utilised for the walls which would generate strong colour contrast as seen from the Henties Bay road as well as the birders. With mitigation in terms of colour and simple, lower profile design of the structures (similar to the Salt Works warehouse design), the construction phase impacts can be reduced to Medium. It is recommended that overhead flood lighting is not utilised.

Closure phase visual impacts have the potential to remain High if the structure are not removed should the project come to an end. The structures would create a sense of landscape decay which is not currently prevalent. Should the structures be removed and the modified areas shaped to allow for natural ground-water run-off, the Closure Phase visual impacts would be Very Low.

Desalinisation Plant Alternative 3

Construction phase impacts without mitigation are likely to be High due to the high exposure of the eastern section of the site to the Henties Bay road. Moderate visual intrusion would be experienced by bird watchers due to greater distance of the proposed site from the pans. The construction phase impacts could be reduced to Low with the location of the site further to the west in closer visual proximity to the Salt Works. It is also recommended that the laydown is located to the south in closer proximity to the Salt Works. Once the final footprint of the plant is defined, a qualified landscape architect should be contracted to assist in the design of the screening berm to ensure that it appears to tie into the natural landscape as seen from the pans.

Operation phase impacts without mitigation would be High if bright colours were utilised for the walls which would generate strong colour contrast as seen from the Henties Bay road as well as the birders. With mitigation in terms of colour and simple, lower profile design of the structures (similar to the Salt Works warehouse design), the construction phase impacts can be reduced to Low. It is recommended that overhead flood lighting is not utilised.

Closure phase visual impacts have the potential to remain High if the structure is not removed should the project come to an end. The structures would create a sense of landscape decay which is not currently prevalent. Should the structures be removed and the modified areas be shaped to allow for natural ground-water run-off, the Closure Phase visual impacts would be Very Low.

Intake Jetty

Specific design plans for the proposed jetty were not available at the time of assessment so confidence levels for impacts were rated as Unsure. Due to the close proximity of the existing Salt Work intake, it is likely that the construction phase impacts would be moderated unless the scale of the proposed intake is larger than that of the exiting jetty, in which case the construction phase impacts could be High. Should the jetty be located in close proximity to the exiting jetty and be of a similar scale, it is likely that they would be viewed as a single entity where-by operation phase impacts would be Medium. Closure phase would require that the structure be removed, unless it can be incorporated into another landuse activity where continued maintenance would reduce the landscape decay effect. It is recommended that overhead flood lighting is not utilised.

Transmission Lines above Ground

Construction and Operation phase impacts have the potential to be High if the powerline is routed directly adjacent the existing cathodic corrosion protection pole route as this will result in strong crowding effects along the road and is not recommended. With mitigation, the visual impacts can be reduced to Moderate. Mitigation would require that the proposed cable be hung on the existing dis-used structures, or that the existing disused poles are replaced by new powerline structures, or by placing the routing 20m to the east of the existing cathodic corrosion protection pole routing to create a visual buffer if permission cannot be granted for removal of the disused poles. Access control should be implemented during construction phase to reduce vehicle tracks as seen from the Henties Bay road followed up with on-going erosion control (if required).

Transmission Lines below Ground

Construction and Operation phase impacts have the potential of being Low as the only visual disturbance would be modified ground from the earthworks and temporary duration. Should the modified area be effectively shaped after construction, the visual impacts would be Very Low.

Cumulative Impacts

Due to the closer proximity of the proposed Alternative 1 and 3 sites to the existing Salt Works which is already seen as a localised development node, cumulative visual impacts can be reduced to Moderate to Low if colour and structure design mitigations are effectively implemented. The use of bright colours would not blend with the muted grey-browns of the surrounding desert and would set a negative precedent for development in the vicinity and is not recommended. Due to the locality of the Alternative 2 further to north away from any existing development nodes, the potential for cumulative impacts increases in terms of setting a precedent for isolated structures in low Visual Absorption Capacity levels environments. This effect could be reduced if effective mitigation was implemented which would reduce the contrast generated by the proposed structure. Effective planning should also be implemented to ensure that the development does not set a precedent for ad hoc development in the area which would lead to a similar ‘ribbon development’ scenario as found between Walvis Bay and Swakopmund which is visually intrusive if not effectively planned.

7 CONCLUSION

A site visit was undertaken on the 5th and 6th of August 2014. During the site visit the regional landscape character was assessed, the site surveyed and Key Observation Points defined. Preliminary findings regarding the visibility were that the C34 and the northern Swakopmund residential areas as well as birders visiting the pans would be exposed to views of the proposed project.

Views from Swakopmund residents are mainly restricted to those located in the outer north-eastern extents of the town. They would have moderate to low exposure views of the proposed plant and substation, but high exposure views of the proposed transmission line. Due to the existing structures visible in the landscape it is likely that their sensitivities to landscape modification would be moderate to low.

The C34 is a gravel road which links the town of Swakopmund with the small fishing and tourist town of Henties Bay. The road follows the coastline northwards and in certain areas, the contrasting views of Atlantic Ocean to the west and flat desert landscapes to the east create higher levels of scenic quality which add to the experience of the Namibian coastline sense of place. This route is utilised for tourism activities which radiate out from Swakopmund and as such it is likely that local and tourist viewers utilising the road would have higher sensitivities to landscape change, but seen with medium exposure. It is also important to note that the area is an important birding destination due to birdlife being attracted to the large evaporation pans required to obtain the salt. It is likely that tourist receptors participating in birding activities at the pans would have high exposure and higher sensitivities to landscape change.

With mitigation, it is unlikely that the existing visual resources would be significantly degraded by the proposed plant alternatives and associated infrastructure, as there is a strong precedent for isolated structures and a jetty in the region set by the Salt Works and the Guano Company. The preference from a visual perspective is Site Alternative 1, followed by Site Alternative 3 (located on the western side of the site) as it is closer to the Salt Works which reduces visual intrusion. It is strongly recommended that the plant structure design and colour follow the suitable example set by the Salt Company most recent warehouse. The simple style of the architecture reduces form contrast created by shadow effects, and the light grey-brown colour significantly reduces the colour contrast. It is recommended that overhead flood lighting is not utilised in order to minimise light spillage at night. Once the final footprint of the plant is defined, a qualified landscape architect should be contracted to assist in the design of the screening berm to ensure that it appears to tie into the natural landscape as seen from the pans. The preferred powerline alternative is the underground option as this would generate the least amount of visual intrusion.

To minimise the potential of cumulative visual impacts associated with ribbon development along the coast, effective planning should also be implemented to ensure that the development does not set a similar coastal development scenario as found between Walvis Bay and Swakopmund which is visually intrusive if not effectively planned.

8 REFERENCES

1. ASTER GDEM. METI / NASA. 2009. Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global Digital Elevation Model Version 2 (GDEM V2 2011). Ministry of Economy, Trade, and Industry (METI) of Japan and United States National Aeronautics and Space Administration (NASA) Source: https://lpdaac.usgs.gov.
2. BLM. USDI. 2004. Bureau of Land Management, U.S. Department of Interior. 2004. Visual Resource Management Manual 8400.
3. Government of the Republic of Namibia, '*Namibia Vision 2030: Policy Framework for Long term Development'*, 2004,. Pg 29, 43. 78
4. IFC. 2012. International Finance Corporation (IFC) prescribes eight performance standards (PS) on environmental and social sustainability. Millennium Ecosystem Assessment. 2005.
5. Lange, E. 1994: Integration of computerized visual Simulation and visual Assessment in environmental Planning. Landscape and Urban Planning.
6. Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town.
7. Sheppard, S.R.J. 2005. Validity, reliability, and ethics in visualization. In: Bishop, I. & Lange, E. (Eds.) Visualization in Landscape and Environmental Planning: Technology and Applications. Taylor and Francis, London. Chapter 5, pp. 79-97. Source: www.calp.forestry.ubc.ca/Coe of Ethics July03.pdf.
8. SLR/Aurecon. 2014. Project 110914 File 2014-07-18 ~ Rössing Desalination EIA Specialist TOR. 18 JULY 2014.
9. U.K Institute of Environmental Management and Assessment (IEMA). 'Guidelines for Landscape and Visual Impact Assessment' Second Edition, Spon Press, 2002. Pg 44.

ANNEXURE 1: SPECIALIST DECLARATION OF INDEPENDENCE

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

Specialist:	VRM AFRICA CC		
Contact person:	STEPHEN STEAD		
Postal address:	P.O BOX 7233, BLANCO		
Postal code:	6531	Cell:	083 560 9911
Telephone:	044 874 0020	Fax:	086 653 3738
E-mail:	steve@vrma.co.za		
Professional affiliation(s) (if any)	Association of Professional Heritage Practitioners South Africa (APHP)		

The specialist appointed in terms of the Regulations

I, **STEPHEN STEAD**, declare that ---

General declaration:

- I act as the independent specialist in this application
  I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

SILVER SOLUTIONS TRADING AS VRM AFRICA

Name of company (if applicable):

23 JANUARY 2013

Date:

ANNEXURE 1A: CURRICULUM VITAE

1. **Position**: Owner / Director
2. **Name of Firm**: Visual Resource Management Africa cc *(www.vrma.co.za)*
3. **Name of Staff**: Stephen Stead
4. **Date of Birth**: 9 June 1967
5. **Nationality:** South African
6. **Contact Details:** **Tel: +27 (0) 44 876 0020**
   Cell: +27 (0) 83 560 9911
   Email: steve@vrma.co.za

---

7. **Educational qualifications**:
   - University of Natal (Pietermaritzburg):
   - Bachelor of Arts: Psychology and Geography
   - Bachelor of Arts (Hons): Human Geography and Geographic Information Management Systems
8. **Professional Accreditation**
   - Association of Professional Heritage Practitioners (APHP) Western Cape
     - Accredited VIA practitioner member of the Association (2011)
9. **Association involvement:** :
   - International Association of Impact Assessment (IAIA) South African Affiliate
     - Past President (2012 - 2013)
     - President (2012)
     - President-Elect (2011)
     - Conference Co-ordinator (2010)
     - National Executive Committee member (2009)
     - Southern Cape Chairperson (2008)
10. **Conferences Attended:**
    - IAIAsa 2012
    - IAIAsa 2011
    - IAIA International 2011 (Mexico)
    - IAIAsa 2010
    - IAIAsa 2009
    - IAIAsa 2007
11. **Continued Professional Development:**
    - Integrating Sustainability with Environment Assessment in South Africa (IAIAsa Conference, 1 day)
    - Achieving the full potential of SIA (Mexico, IAIA Conference, 2 days 2011)
    - Researching and Assessing Heritage Resources Course (University of Cape Town, 5 days, 2009)
12. **Countries of Work Experience**:
    - South Africa, Mozambique, Malawi, Lesotho, Kenya and Namibia
13. **Relevant Experience:**

    Stephen gained six years of experience in the field of Geographic Information Systems mapping and spatial analysis working as a consultant for the KwaZulu-Natal Department of Health and then with an Environmental Impact Assessment company based in the Western Cape. In 2004 he set up the company Visual Resource Management Africa which specializes in visual resource management and visual impact assessments in Africa. The company makes use of the well documented Visual Resource Management methodology developed by the Bureau of Land Management (USA) for assessing the suitability of

landscape modifications. In association with ILASA qualified landscape architect Liesel Stokes, he has assessed of over 100 major landscape modifications through-out southern and eastern Africa. The business has been operating for eight years and has successfully established and retained a large client base throughout Southern Africa which include amongst other, Rio Tinto (Pty) Ltd, Bannerman (Pty) Ltd, Anglo Coal (Pty) Ltd, Eskom (Pty) Ltd, NamPower and Vale (Pty) Ltd, Ariva (Pty) Ltd, Harmony Gold (Pty) Ltd, Mellium Challenge Account (USA), Pretoria Portland Cement (Pty) Ltd

14. Languages:

- English – First Language
- Afrikaans – fair in speaking, reading and writing

15. Projects:

A list of ***some*** of the large scale projects that VRMA has assessed has been attached below with the client list indicated per project (Refer to www.vrma.co.za for a full list of projects undertaken).

YEAR	NAME	DESCRIPTION	LOCATION
2014	Joram Solar	Solar Energy	Northern Cape
2014	RERE PV Postmasberg	Solar Energy	Northern Cape
2014	RERE CPV Upington	Solar Energy	Northern Cape
2014	Rio Tinto RUL Desalinisation Plant	Industrial	Namibia
2014	NamPower PV	Solar Energy	Namibia
2014	Pemba Oil and Gas Port Expansion	Industrial	Mozambique
2014	Brightsource CSP Upington	Solar Energy	Northern Cape
2013	Cape Winelands DM Regional Landfill	Industrial	Western Cape
2013	Drennan PV Solar Park	PV Solar Energy	Eastern Cape
2013	Eastern Cape Mari-culture	Mari-culture	Eastern Cape
2013	Eskom Pantom Pass Substation	Substation /Tx lines	Knysna
2013	Frankfort Paper Mill	Plant	Free State
2013	Gibson Bay Wind Farm Transmission lines	Tranmission lines	Eastern Cape
2013	Houhoek Eskom Substation	Substation /Tx lines	Western Cape
2013	Mulilo PV Solar Energy Sites (x4)	PV Solar Energy	Northern Cape
2013	Namies Wind Farm	Wind Energy	Northern Cape
2013	Rossing Z20 Pit and WRD	Mining	Namibia
2013	SAPPI Boiler Upgrade	Plant	Mpumalanga
2013	Tumela WRD	Mine	North West
2013	Weskusfleur Substation (Koeburg)	Substation /Tx lines	Western Cape
2013	Yzermyn coal mine	Mine	Mpumalanga
2012	Afrisam	Mine	Saldana
2012	Bitterfontein	PV Energy	N Cape
2012	Bitterfontein slopes	Slopes Analysis	N Cape
2012	Kangnas PV	Energy	N Cape
2012	Kangnas Wind	Energy	N Cape
2012	Kathu CSP Tower	Solar Power	Northern Cape
2012	Kobong Hydro	Hydro & Powerline	Lesotho
2012	Letseng Diamond Mine Upgrade	Mine	Lesotho
2012	Lunsklip Windfarm	Windfarm	Stilbaai
2012	Mozambique Gas Engine Power Plant	Plant	Mozambique
2012	Ncondezi Thermal Power Station	Substation /Tx lines	Mozambique

YEAR	NAME	DESCRIPTION	LOCATION
2012	Sasol CSP Tower	Solar Power	Free State
2012	Sasol Upington CSP Tower	Solar Power	Northern Cape
2011	Beaufort West PV Solar Power Station	Power Station	Beaufort West
2011	Beaufort West Wind Farm	Wind Energy	Beaufort West
2011	De Bakke Cell Phone Mast	Mast	Western Cape
2011	ERF 7288 PV	PV	Beaufort West
2011	Gecko Industrial park	Industrial	Namibia
2011	Green View Estates	Residential	Mossel Bay
2011	Hoodia Solar	PV expansion	Beaufort West
2011	Kalahari Solar Power Project	Solar Power	Northern Cape
2011	Khanyisa Power Station	Power Station	Western Cape
2011	Laingsburg Windfarm	Level 4	Mpumalanga
2011	Olvyn Kolk PV	Solar Power	Northern Cape
2011	Otjikoto Gold Mine	Mining	Namibia
2011	PPC Rheebieck West Upgrade	Industrial	
2011	Slopes analysis Erf 7288 Beaufort West	Slopes	Beaufort West
2011	Southern Arterial	Road	George
2010	Bannerman Etango Uranium Mine	Mining	Namibia
2010	Bantamsklip Transmission Revision	Transmission	Eastern Cape
2010	Beaufort West Urban Edge	Mapping	Beaufort West
2010	Bon Accord Nickel Mine	Mine	Barbeton
2010	Herolds Bay N2 Development Baseline	Residential	George
2010	MTN Lattice Hub Tower	Structure	George
2010	N2 Herolds Bay Residental	Residential	Herolds Bay
2010	Onifin(Pty) Ltd Hartenbos Quarry Extension	Mining	Mossel Bay
2010	Rossing South Board Meeting	Mining	Namibia
2010	Still Bay East	Mapping	SA, WC
2010	Vale Moatize Coal Mine and Railwayline	Mining_rail	Mozambique
2010	Vodacom Mast	Structure	Reichterbosch
2010	Wadrif Dam	Dam	Beaufort West
2009	Asazani Zinyoka UISP Housing	Residential Infill	Mossel Bay
2009	Bantamsklip GIS Mapping	Mappig	Western Cape
2009	Eden Telecommunication Tower	Structure Tower	George
2009	George Landscape Characterisation	George SDF	George
2009	George Western Bypass	Structure Road	George
2009	Rossing Uranium Mine Phase 2	Mining	Namibia
2009	Sun Ray Wind Farm	Wind Energy	Still Bay
2008	Bantamsklip Transmission Lines Scoping	Transmission	Western Cape
2008	Erf 251 Damage Assessment	Residential VIA	Great Brak
2008	Erongo Uranium Rush SEA	SEA	Namibia
2008	Evander South Gold Mine Preliminary VIA	Mining	Mpumalanga
2008	George Open Spaces System	George SDF	George
2008	GrooteSchuur Heritage Mapping	Mapping	Cape Town

YEAR	NAME	DESCRIPTION	LOCATION
2008	Hartenbos River Park	Residential VIA	Hartenbos
2008	Kaaimans Project	Residential	Wilderness
2008	Lagoon Garden Estate	Residential VIA	Great Brak
2008	Moquini Beach Hotel	Resort	Mossel Bay
2008	NamPower Coal fired Power Station	Power Station	Namibia
2008	Oasis Development	Residential VIA	Plettenberg Bay
2008	RUL Sulpher Handling Facility	Mining	Walvis Bay
2008	Stonehouse Development	Residential VIA	Plettenberg Bay
2008	Walvis Bay Power Station	Structure	Namibia.
2007	Calitzdorp Retirement Village	Residential VIA	Calitzdorp
2007	Calitzdorp Visualisation	Visualisation	Calitzdorp
2007	Camdeboo Estate	Residential VIA	Graaff Reinet
2007	Destiny Africa	Residential	George
2007	Droogfontein Farm 245	Residential VIA	Danabaai
2007	Floating Liquified Natural Gas Facility	Structure tanker	Mossel Bay
2007	George Municipality Densification	George SDF	George
2007	George Municipality SDF	George SDF	George
2007	Kloofsig Development	Residential VIA	Vleesbaai
2007	OCGT Power Plant Extension	Structure Power Plant	Mossel Bay
2007	Oudtshoorn Municipality SDF	Mapping	Oudtshoorn
2007	Oudtshoorn Shopping Complex	Structure Mall	Oudtshoorn
2007	Pezula Infill (Noetzie)	Residential VIA	Knysna
2007	Pierpoint Nature Reserve	Residential VIA	Knysna
2007	Pinnacle Point Golf Estate	Golf/Residential	Mossel Bay
2007	Rheebok Development Erf 252 Apeal	Residential VIA	Great Brak
2007	Rossing Uranium Mine Phase 1	Mining	Namibia
2007	Ryst Kuil/Riet Kuil Uranium Mine	Mining	Beaufort West
2007	Sedgefield Water Works	Structure	Sedgefield
2007	Sulpher Handling Station Walvis Bay Port	Industrial	Namibia
2007	Trekkopje Uranium Mine	Mining	Namibia
2007	Weldon Kaya	Residential VIA	Plettenberg Bay
2006	Fancourt Visualisation Modelling	Visualisation	George
2006	Farm Dwarsweg 260	Residential VIA	Great Brak
2006	Fynboskruin Extention	Residential VIA	Sedgefield
2006	Hanglip Golf and Residential Estate	Golf/Residential	Plettenberg Bay
2006	Hansmoeskraal	Slopes Analysis	George
2006	Hartenbos Landgoed Phase 2	Residential VIA	Hartenbos
2006	Hersham Security Village	Residential VIA	Great Brak
2006	Ladywood Farm 437	Residential VIA	Plettenberg Bay
2006	Le Grand Golf and Residential Estate	Golf/Residential	George
2006	Paradise Coast	Residential VIA	Mossel Bay
2006	Paradyskloof Residential Estate	Residential VIA	Stellenbosch
2006	Riverhill Residential Estate	Residential VIA	Wilderness

YEAR	NAME	DESCRIPTION	LOCATION
2006	Wolwe Eiland Access Route	Road	Victoria Bay
2005	Harmony Gold Mine	Mining	Mpumalanga.
2005	Knysna River Reserve	Residential VIA	Knysna
2005	Kruisfontein Infill	Mapping	Knysna
2005	Lagoon Bay Lifestyle Estate	Residential VIA	Glentana
2005	Outeniquabosch Safari Park	Residential	Mossel Bay
2005	Proposed Hotel Farm Gansevallei	Resort	Plettenberg Bay
2005	Uitzicht Development	Residential VIA	Knysna
2005	West Dunes	Residential VIA	Knysna
2005	Wilderness Erf 2278	Residential VIA	Wilderness
2005	Wolwe Eiland Eco & Nature Estate	Residential VIA	Victoria Bay
2005	Zebra Clay Mine	Mining	Zebra
2004	Gansevallei Hotel	Residential VIA	Plettenberg Bay
2004	Lakes Eco and Golf Estate	Golf/Residential	Sedgefield
2004	Trekkopje Desalination Plant	Structure Plant	Namibia
1995	Greater Durban Informal Housing Analysis	Photogrametry	Durban

ANNEXURE 2: QUESTIONNAIRES AND VRM TERMINOLOGY

Methodology Detail

Viewshed

The visible extent, or viewshed, is 'the outer boundary defining a view catchment area, usually along crests and ridgelines' *(Oberholzer, 2005).* This reflects the area, or extent, where the landscape modification would probably be seen. However, visibility tends to diminish exponentially with distance, which is well recognised in visual analysis literature. Therefore the views of a landscape modification would not necessarily influence the landscape character within all areas of the viewshed. The information for the terrain used in the 3D computer model on which the visibility analysis is based on the Advanced Spaceborne Thermal Emission and Reflection (ASTER) Radiometer Data, a product of Japan's Ministry of Economy, Trade and Industry (METI) and National Aeronautics and Space Administration (NASA) in USA. *(ASTER GDEM. METI / NASA. 2011)*

Receptor Exposure

The area where a landscape modification starts to influence the landscape character is termed the Zone of Visual Influence (ZVI) and is defined by the U.K. Institute of Environmental Management and Assessment's (IEMA) *'Guidelines for Landscape and Visual Impact Assessment'* as 'the area within which a proposed development may have an influence or effect on visual amenity (of the surrounding areas).'

The inverse relationship of distance and visual impact is well recognised in visual analysis literature *(Hull, R.B. and Bishop, I.E., 1988)*. According to Hull and Bishop, exposure, or visual impact, tends to diminish exponentially with distance. The areas where most landscape modifications would be visible are located within 2 km from the site of the landscape modification. Thus the potential visual impact of an object diminishes at an exponential rate as the distance between the observer and the object increases due to atmospheric conditions prevalent at a location, which causes the air to appear greyer, thereby diminishing detail. For example, viewed from 1000 m from a landscape modification, the impact would be 25% of the impact as viewed from 500 m from a landscape modification. At 2000m it would be 10% of the impact at 500 m. The relationship is indicated in the following graph generated by Hull and Bishop.

The VRM methodology also takes distance from a landscape modification into consideration in terms of understanding visual resource. Three distance categories are defined by the Bureau of Land Management. The distance zones are:

i. ***Foreground / Middle ground***, up to approximately 6km, which is where there is potential for the sense of place to change;
ii. ***Background areas***, from 6km to 24km, where there is some potential for change in the sense of place, but where change would only occur in the case of very large landscape modifications; and
iii. ***Seldom seen areas***, which fall within the Foreground / Middle ground area but, as a result of no receptors, are not viewed or are seldom viewed.

Scenic Quality

In terms of the VRM methodology, landscape character is derived from a combination of scenic quality, receptor sensitivity to landscape change, and distance of the proposed landscape modification from key receptor points. The scenic quality is determined making use of the VRM scenic quality questionnaire

(refer to addendum). Seven scenic quality criteria area scored on a 1 (low) to 5 (high) scale. The scores are totalled and assigned a A (High), B (Moderate) or C (low) based on the following split:
A= scenic quality rating of ≥19;
B = rating of 12 – 18,
C= rating of ≤11

The seven scenic quality criteria are defined below:

- **Land Form:** Topography becomes more of a factor as it becomes steeper, or more severely sculptured.
- **Vegetation:** Primary consideration given to the variety of patterns, forms, and textures created by plant life.
- **Water:** That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration.
- **Colour:** The overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) are considered as they appear during seasons or periods of high use.
- **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.
- **Adjacent Land Use:** Degree to which scenery and distance enhance, or start to influence, the overall impression of the scenery within the rating unit.
- **Cultural Modifications:** Cultural modifications should be considered, and may detract from the scenery or complement or improve the scenic quality of an area.

Receptor Sensitivity

Sensitivity levels are a measure of public concern for scenic quality. Receptor sensitivity to landscape change is determined by rating the following factors in terms of Low to High:

- **Type of Users:** Visual sensitivity will vary with the type of users, e.g. recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change.
- **Amount of Use:** Areas seen or used by large numbers of people are potentially more sensitive.
- **Public Interest:** The visual quality of an area may be of concern to local, or regional, groups. Indicators of this concern are usually expressed via public controversy created in response to proposed activities.
- **Adjacent Land Uses:** The interrelationship with land uses in adjacent lands. For example, an area within the viewshed of a residential area may be very sensitive, whereas an area surrounded by commercially developed lands may not be as visually sensitive.
- **Special Areas:** Management objectives for special areas such as Natural Areas, Wilderness Areas or Wilderness Study Areas, Wild and Scenic Rivers, Scenic Areas, Scenic Roads or Trails, and Critical Biodiversity Areas frequently require special consideration for the protection of their visual values.
- **Other Factors:** Consider any other information such as research or studies that include indicators of visual sensitivity.

Visual Resource Management (VRM) Classes

The VRM Classes represent the relative value of the visual resources of an area and are determined making use of the VRM Class Matrix see Table ##:

iv. **Classes I and II** are the most valued;
v. **Class III** represents a moderate value; and
vi. **Class IV** is of least value.

The Classes are not prescriptive and are utilised as a guideline to determine visual carrying capacity. The Visual Inventory Classes are defined using the matrix below and with motivation, can be adjusted to Visual Resource Management Classes:

		VISUAL SENSITIVITY LEVELS								
		High			Medium			Low		
SCENIC QUALITY	A (High)	II	II	II	II	II	II	II	II	II
	B (Medium)	II	III	III/ IV *	III	IV	IV	IV	IV	IV
	C (Low)	III	IV	IV	IV	IV	IV	IV	IV	IV
DISTANCE ZONES		fore/middle ground	Background	seldom seen	fore/middle ground	background	seldom seen	fore/middle ground	background	seldom seen

* If adjacent areas are **Class III** or lower, assign **Class III**, if higher, assign **Class IV**

The visual objectives of each of the classes is listed below:

- The Class I objective is to preserve the existing character of the landscape, the level of change to the characteristic landscape should be very low, and must not attract attention. Class I is assigned when a specialist decision is made to maintain a natural landscape.
- The Class II objective is to retain the existing character of the landscape and the level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer, and should repeat the basic elements of form, line, colour and texture found in the predominant natural features of the characteristic landscape.
- The Class III objective is to partially retain the existing character of the landscape, where the level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer, and changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- The Class IV objective is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the landscape can be high, and these management activities may dominate the view and be the major focus of the viewer's (s') attention.

Key Observation Points (KOPs)

KOPs are defined by the Bureau of Land Management as the people (receptors) located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape modifications are proposed. These locations are important in terms of the VRM methodology, which requires that the Degree of Contrast (DoC) that the proposed landscape modifications will make to the existing landscape is measured from these most critical locations, or receptors, surrounding the property.

To define the KOPs, potential receptor locations were identified in the viewshed analysis, and screened, based on the following criteria:

- Angle of observation;
- Number of viewers;

- Length of time the project is in view;
- Relative project size;
- Season of use;
- Critical viewpoints, e.g. views from communities, road crossings; and
- Distance from property.

Contrast Rating

The contrast rating, or impacts assessment phase, is undertaken to determine if the VRM Class Objectives are met. The suitability of landscape modification is assessed by comparing the degree of potential contrast from the proposed activity in comparison to the existing contrast created by the existing landscape. This is done by evaluating the level of change to the existing landscape by assessing the line, colour, texture and form, in relation to the visual objectives defined for the area. The following criteria are utilised in defining the DoC:

- **None**: The element contrast is not visible or perceived.
- **Weak**: The element contrast can be seen but does not attract attention.
- **Moderate**: The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- **Strong**: The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

As an example, in a Class I area, the visual objective is to preserve the existing character of the landscape, and the resultant contrast to the existing landscape should not be notable to the casual observer and cannot attract attention. In a Class IV area example, the objective is to provide for proposed landscape activities which require major modifications of the existing character of the landscape. Based on whether the VRM objectives are met, mitigations, if required, are defined to avoid, reduce or mitigate the proposed landscape modifications so that the visual impact does not detract from the surrounding landscape sense of place.

Photo Montages and 3D Visualisation

As a component in this contrast rating process, visual representation, such as photo montages are vital in large-scale modifications, as this serves to inform I&APs and decision-making authorities of the nature and extent of the impact associated with the proposed project/development. There is an ethical obligation in this process, as visualisation can be misleading if not undertaken ethically. In terms of adhering to standards for ethical representation of landscape modifications, VRM Africa subscribes to the Proposed Interim Code of Ethics for Landscape Visualisation developed by the Collaborative for Advanced Landscape Planning (CALP) (July 2003)*(Sheppard, S.R.J., 2005)*. This code states that professional presenters of realistic landscape visualisations are responsible for promoting full understanding of proposed landscape changes, providing an honest and neutral visual representation of the expected landscape, by seeking to avoid bias in responses and demonstrating the legitimacy of the visualisation process. Presenters of landscape visualisations should adhere to the principles of:

- Access to Information
- Accuracy
- Legitimacy
- Representativeness
- Visual Clarity and Interest

The Code of Ethical Conduct states that the presenter should:

- Demonstrate an appropriate level of qualification and experience.
- Use visualisation tools and media that are appropriate to the purpose.
- Choose the appropriate level of realism.
- Identify, collect and document supporting visual data available for, or used in, the visualisation process.
- Conduct an on-site visual analysis to determine important issues and views.
- Seek community input on viewpoints and landscape issues to address in the visualisations.
- Provide the viewer with a reasonable choice of viewpoints, view directions, view angles, viewing conditions and timeframes appropriate to the area being visualised.
- Estimate and disclose the expected degree of uncertainty, indicating areas and possible visual consequences of the uncertainties.
- Use more than one appropriate presentation mode and means of access for the affected public.
- Present important non-visual information at the same time as the visual presentation, using a neutral delivery.
- Avoid the use, or the appearance of, 'sales' techniques or special effects.
- Avoid seeking a particular response from the audience.
- Provide information describing how the visualisation process was conducted and how key decisions were taken *(Sheppard, S.R.J., 2005)*.

BLM VRM Questionnaires

Scenic Quality Rating Questionnaire

KEY FACTORS	**RATING CRITERIA AND SCORE**		
SCORE	**5**	**3**	**1**
Land Form	High vertical relief as expressed in prominent cliffs, spires or massive rock outcrops, or severe surface variation or highly eroded formations or detail features that are dominating and exceptionally striking and intriguing.	Steep-sided river valleys, or interesting erosion patterns or variety in size and shape of landforms; or detail features that are interesting, though not dominant or exceptional.	Low rolling hills, foothills or flat valley bottoms; few or no interesting landscape features.
Vegetation	A variety of vegetative types as expressed in interesting forms, textures and patterns.	Some variety of vegetation, but only one or two major types.	Little or no variety or contrast in vegetation.
Water	Clear and clean appearing, still or cascading white water, any of which are a dominant factor in the landscape.	Flowing, or still, but not dominant in the landscape.	Absent, or present but not noticeable.
Colour	Rich colour combinations, variety or vivid colour: or pleasing contrasts in the soil, rock, vegetation, water.	Some intensity or variety in colours and contrast of the soil, rock and vegetation, but not a dominant scenic element.	Subtle colour variations contrast or interest: generally mute tones.
Adjacent Scenery	Adjacent scenery greatly enhances visual quality.	Adjacent scenery moderately enhances overall visual quality.	Adjacent scenery has little or no influence on overall visual quality.
Scarcity	One of a kind: unusually memorable, or very rare within region. Consistent chance for	Distinctive, though somewhat similar to others within the region.	Interesting within its setting, but fairly common within the

	exceptional wildlife or wildflower viewing etc.		region.
SCORE	**2**	**0**	**-4**
Cultural Modification	Modifications add favourably to visual variety, while promoting visual harmony.	Modifications add little or no visual variety to the area, and introduce no discordant elements.	Modifications add variety but are very discordant and promote strong disharmony.

Receptor Sensitivity Level Rating Questionnaire

FACTORS	QUESTIONS	
Type of Users	**Maintenance of visual quality is:**	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low
Amount of use	**Maintenance of visual quality becomes more important as the level of use increases:**	
	A high level of use	High
	Moderately level of use	Moderate
	Low level of use	Low
Public interest	**Maintenance of visual quality:**	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low
Adjacent land Users	**Maintenance of visual quality to sustain adjacent land use objectives is:**	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low
Special Areas	**Maintenance of visual quality to sustain Special Area management objectives is:**	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low

VRM Terminology

FORM	LINE	COLOUR	TEXTURE
Simple	Horizontal		Smooth
Weak	Vertical		Rough
Strong	Geometric		Fine
Dominant	Angular		Coarse
Flat	Acute		Patchy
Rolling	Parallel		Even
Undulating	Curved	Dark	Uneven
Complex	Wavy	Light	Complex
Plateau	Strong	Mottled	Simple
Ridge	Weak		Stark
Valley	Crisp		Clustered
Plain	Feathered		Diffuse
Steep	Indistinct		Dense
Shallow	Clean		Scattered
Organic	Prominent		Sporadic
Structured	Solid		Consistent

Simple	Basic, composed of few elements	**Organic**	Derived from nature; occurring or developing gradually and naturally
Complex	Complicated; made up of many interrelated parts	**Structure**	Organised; planned and controlled; with definite shape, form, or pattern
Weak	Lacking strength of character	**Regular**	Repeatedly occurring in an ordered fashion
Strong	Bold, definite, having prominence	**Horizontal**	Parallel to the horizon
Dominant	Controlling, influencing the surrounding environment	**Vertical**	Perpendicular to the horizon; upright
Flat	Level and horizontal without any slope; even and smooth without any bumps or hollows	**Geometric**	Consisting of straight lines and simple shapes
Rolling	Progressive and consistent in form, usually rounded	**Angular**	Sharply defined; used to describe an object identified by angles
Undulating	Moving sinuously like waves; wavy in appearance	**Acute**	Less than 90°; used to describe a sharp angle
Plateau	Uniformly elevated flat to gently undulating land bounded on one or more sides by steep slopes	**Parallel**	Relating to or being lines, planes, or curved surfaces that are always the same distance apart and therefore never meet
Ridge	A narrow landform typical of a highpoint or apex; a long narrow hilltop or range of hills	**Curved**	Rounded or bending in shape
Valley	Low-lying area; a long low area of land, often with a river or stream running through it, that is surrounded by higher ground	**Wavy**	Repeatedly curving forming a series of smooth curves that go in one direction and then another
Plain	A flat expanse of land; fairly flat dry land, usually with few trees	**Feathered**	Layered; consisting of many fine parallel strands
Steep	Sloping sharply often to the extent of being almost vertical	**Indistinct**	Vague; lacking clarity or form
Prominent	Noticeable; distinguished, eminent, or well-known	**Patchy**	Irregular and inconsistent;
Solid	Unadulterated or unmixed; made of the same material throughout; uninterrupted	**Even**	Consistent and equal; lacking slope, roughness, and irregularity
Broken	Lacking continuity; having an uneven surface	**Uneven**	Inconsistent and unequal in measurement irregular
Smooth	Consistent in line and form; even textured	**Stark**	Bare and plain; lacking ornament or relieving features
Rough	Bumpy; knobbly; or uneven, coarse in texture	**Clustered**	Densely grouped
Fine	Intricate and refined in nature	**Diffuse**	Spread through; scattered over an area

Coarse	Harsh or rough to the touch; lacking detail	**Diffuse**	To make something less bright or intense

ANNEXURE 3: GENERAL LIGHTS AT NIGHT MITIGATIONS

Mitigation:

- Effective light management needs to be incorporated into the design of the lighting to ensure that the visual influence is limited to the mine, without jeopardising mine operational safety and security (See lighting mitigations by The New England Light Pollution Advisory Group (NELPAG) and Sky Publishing Corp in 14.2).
- Utilisation of specific frequency LED lighting with a green hue on perimeter security fencing.
- Directional lighting on the more exposed areas of operation, where point light source is an issue.
- No use of overhead lighting and, if possible, locate the light source closer to the operation.
- If possible, the existing overhead lighting method utilised at the mine should be phased out and replaced with an alternative lighting using closer to source, directed LED technology.

Mesopic Lighting

Mesopic vision is a combination of photopic vision and scotopic vision in low, but not quite dark, lighting situations. The traditional method of measuring light assumes photopic vision and is often a poor predictor of how a person sees at night. The light spectrum optimized for mesopic vision contains a relatively high amount of bluish light and is therefore effective for peripheral visual tasks at mesopic light levels. *(CIE, 2012)*

The Mesopic Street Lighting Demonstration and Evaluation Report by the Lighting Research Centre (LRC) in New York found that the 'replacement of white light sources (induction and ceramic metal halide) were tuned to optimize human vision under low light levels while remaining in the white light spectrum. Therefore, outdoor electric light sources that are tuned to how humans see under mesopic lighting conditions can be used to reduce the luminance of the road surface while providing the same, or better, visibility. Light sources with shorter wavelengths, which produce a "cooler" (more blue and green) light, are needed to produce better mesopic vision. Based on this understanding, the LRC developed a means of predicting visual performance under low light conditions. This system is called the unified photometry system. Responses to surveys conducted on new installations revealed that area residents perceived higher levels of visibility, safety, security, brightness, and colour rendering with the new lighting systems than with the standard *High-Purity Standards* (HPS) systems. The new lighting systems used 30% to 50% less energy than the HPS systems. These positive results were achieved through tuning the light source to optimize mesopic vision. Using less wattage and photopic luminance also reduces the reflectance of the light off the road surface. Light reflectance is a major contributor to light pollution (sky glow).' *(Lighting Research Center. New York. 2008)*

‘Good Neighbour – Outdoor Lighting’

Presented by the New England Light Pollution Advisory Group (NELPAG) http://cfa/ www.harvard .edu /cfa/ps/nelpag.html) and Sky & Telescope http://SkyandTelescope.com/). NELPAG and Sky & Telescope support the International Dark-Sky Association (IDA) *(http://www.darksky.org/).*

What is good lighting? Good outdoor lights improve visibility, safety, and a sense of security, while minimizing energy use, operating costs, and ugly, dazzling glare.

Why should we be concerned? Many outdoor lights are poorly designed or improperly aimed. Such lights are costly, wasteful, and distractingly glary. They harm the night-time environment and neighbours’ property values. Light directed uselessly above the horizon creates murky skyglow — the “light pollution” that washes out our view of the stars.

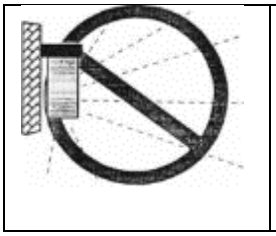
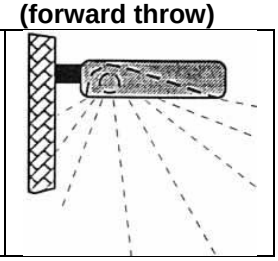
Glare Here’s the basic rule of thumb: If you can see the bright bulb from a distance, it’s a bad light. With a good light, you see lit ground instead of the dazzling bulb. “Glare” is light that beams directly from a bulb into your eye. It hampers the vision of pedestrians, cyclists, and drivers.

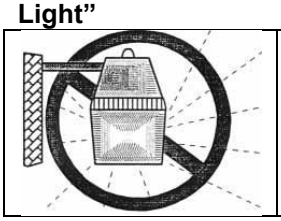
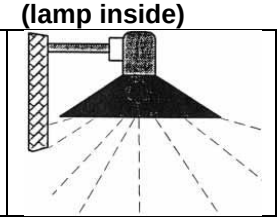
Light Trespass Poor outdoor lighting shines onto neighbours’ properties and into bedroom windows, reducing privacy, hindering sleep, and giving the area an unattractive, trashy look.

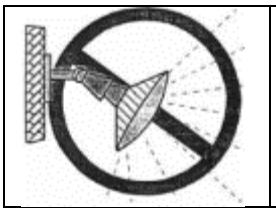
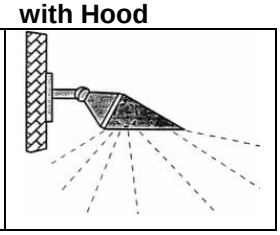
Energy Waste Many outdoor lights waste energy by spilling much of their light where it is not needed, such as up into the sky. This waste results in high operating costs. Each year we waste more than a billion dollars in the United States needlessly lighting the night sky.

Excess Lighting Some homes and businesses are flooded with much stronger light than is necessary for safety or security.

Good and Bad Light Fixtures

Typical “Wall Pack”	**Typical “Shoe Box” (forward throw)**
	
BAD Waste light goes up and sideways	**GOOD** Directs all light down

Typical “Yard Light”	**Opaque Reflector (lamp inside)**
	
BAD Waste light goes up and sideways	**GOOD** Directs all light down

Area Flood Light	**Area Flood Light with Hood**
	
BAD Waste light goes up and sideways	**GOOD** Directs all light down

How do I switch to good lighting?
Provide only enough light for the task at hand; don’t over-light, and don’t spill light off your property. Specifying enough light for a job is sometimes hard to do on paper. Remember that a full Moon can make an area quite bright. Some lighting systems illuminate areas 100 times more brightly than the full Moon! More importantly, by choosing properly shielded lights, you can meet your needs without bothering neighbours or polluting the sky.

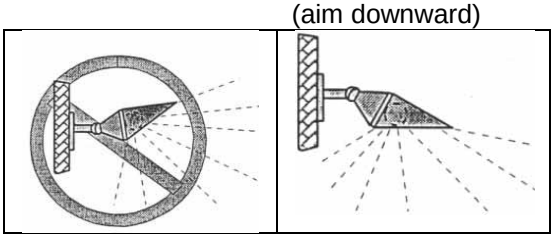
1. Aim lights down. Choose “full-cutoff shielded” fixtures that keep light from going uselessly up or sideways. Full-cutoff fixtures produce minimum glare. They create a pleasant-looking environment. They increase safety because you see illuminated people, cars, and terrain, not dazzling bulbs.

2. Install fixtures carefully to maximize their effectiveness on the targeted area and minimize their impact elsewhere. Proper aiming of fixtures is crucial. Most are aimed too high. Try to install them at night, when you can see where all the rays actually go. Properly aimed and shielded lights may cost more initially, but they save you far more in the long run. They can illuminate your target with a low-wattage bulb just as well as a wasteful light does with a high-wattage bulb.

3. If colour discrimination is not important, choose energy-efficient fixtures utilising yellowish high-pressure sodium (HPS) bulbs. If “white” light is needed, fixtures using compact fluorescent or metal-halide (MH) bulbs are more energy-efficient than those using incandescent, halogen, or mercury-vapour bulbs.

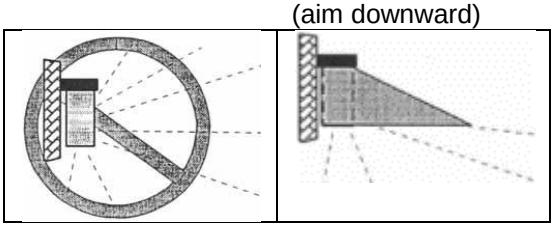
What You Can Do To Modify Existing Fixtures

Change this . . . to this (aim downward)



Floodlight:

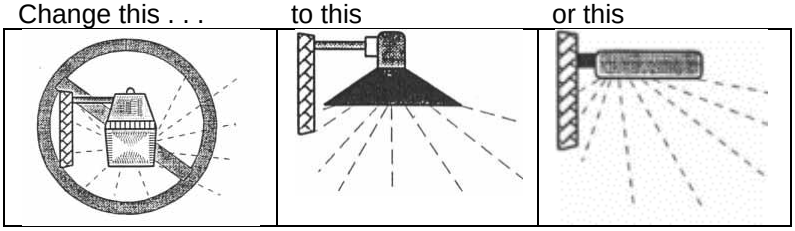
Change this . . . to this (aim downward)



Wall Pack

4. Where feasible, put lights on timers to turn them off each night after they are no longer needed. Put home security lights on a motion-detector switch, which turns them on only when someone enters the area; this provides a great deterrent effect!

Change this . . . to this or this



Yard Light | Opaque Reflecter | Show Box

Replace bad lights with good lights.
You’ll save energy and money. You’ll be a good neighbour. And you’ll help preserve our view of the stars.

ANNEXURE 4: AURECON RISK ASSESSMENT METHODOLOGY

A standardised and internationally recognised methodology (Government of SA, 2004) has been applied to assess the significance of the potential environmental impacts of Rössing Uranium's project, outlined as follows:

For each impact, the EXTENT (spatial scale), MAGNITUDE (size or degree scale) and DURATION (time scale) will be described. These criteria are used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The mitigation described in the SEIA Report will represent the full range of plausible and pragmatic measures but does not necessarily imply that they should or will all be implemented. The decision as to which combination of alternatives and mitigation measures to apply for will lie with RU as the proponent, and their acceptance and approval ultimately with MET:DEA and MME. The SEIA Report will explicitly describe RU's commitments in this regard. The tables on the following pages show the scales used to assess these variables and define each of the rating categories.

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	**National**	Within Namibia
	Regional	Within the Erongo Region
	Local	On site or within 100 m of the impact site
Magnitude of impact (at the indicated spatial scale)	**High**	Social and/or natural functions and/ or processes are *severely* altered
	Medium	Social and/or natural functions and/ or processes are *notably* altered
	Low	Social and/or natural functions and/ or processes are *slightly* altered
	Very Low	Social and/or natural functions and/ or processes are *negligibly* altered
	Zero	Social and/or natural functions and/ or processes remain *unaltered*
Duration of impact	**Short term**	Up to 3 years
	Medium Term	4 to 10 years after construction
	Long Term	More than 10 years after construction

Table: Assessment criteria for the evaluation of impacts

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and magnitude. The means of arriving at the different significance ratings is explained in the following table, developed by Ninham Shand in 1995 as a means of minimising subjectivity in such evaluations, i.e. to allow for standardisation in the determination of significance.

SIGNIFICANCE RATINGS	LEVEL OF CRITERIA REQUIRED
High	• High magnitude with a regional extent and long term duration • High magnitude with either a regional extent and medium term duration or a local extent and long term duration • Medium magnitude with a regional extent and long term duration
Medium	• High magnitude with a local extent and medium term duration • High magnitude with a regional extent and construction period or a site specific extent and long term duration • High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration • Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Low magnitude with a regional extent and long term duration
Low	• High magnitude with a site specific extent and construction period duration • Medium magnitude with a site specific extent and construction period duration • Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Very low magnitude with a regional extent and long term duration
Very low	• Low magnitude with a site specific extent and construction period duration • Very low magnitude with any combination of extent and duration except regional and long term
Neutral	• Zero magnitude with any combination of extent and duration

Table: Definition of significance ratings

Once the significance of an impact has been determined, the PROBABILITY of this impact occurring as well as the CONFIDENCE in the assessment of the impact would be determined using the rating systems outlined in the following two tables. It is important to note that the significance of an impact should always be considered in concert with the probability of that impact occurring.

PROBABILITY RATINGS	CRITERIA
Definite	Estimated greater than 95% chance of the impact occurring.
Probable	Estimated 5 to 95% chance of the impact occurring.
Unlikely	Estimated less than 5% chance of the impact occurring.

Table: Definition of probability ratings

CONFIDENCE RATINGS	CRITERIA
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

Table: Definition of confidence ratings

Lastly, the REVERSIBILITY of the impact is estimated using the rating system outlined in the following table.

REVERSIBILITY RATINGS	CRITERIA
Irreversible	***THE ACTIVITY WILL LEAD TO AN IMPACT THAT IS PERMANENT.***
Reversible	***THE IMPACT IS REVERSIBLE, WITHIN A PERIOD OF 10 YEARS.***

Table: Definition of reversibility ratings

ANNEXURE 5: CONSIDERATION OF CUMULATIVE IMPACTS

Namibia's Environmental Assessment Policy requires that, "as far asis practicable", cumulative environmental impacts should be taken into account in all environmental assessment processes. Environmental impact assessments have traditionally, however, failed to come to terms with such impacts, largely as a result of the following considerations:

Cumulative effects may be local, regional or global in scale and dealing with such impacts requires co-ordinated institutional arrangements; and

Environmental assessments are typically carried out on specific developments, whereas cumulative impacts result from broader biophysical, social and economic considerations, which typically cannot be addressed at the project level.