

**SOCIAL AND ENVIRONMENTAL IMPACT  
ASSESSMENT: PROPOSED EXPANSION  
PROJECT FOR RÖSSING URANIUM MINE IN  
NAMIBIA: PHASE 1 ~ ACID PLANT, ORE  
SORTER & SK4 PIT**

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***SCOPING REPORT***

NOVEMBER 2007



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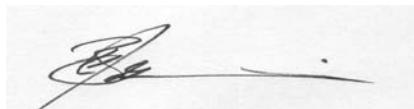
## PROJECT DETAILS

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<b>TITLE</b>	Social and Environmental Impact Assessment: Proposed Expansion Project for Rössing Uranium Mine in Namibia: Phase 1 ~ Acid Plant, Ore Sorter and SK4 Pit
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## ACRONYMS

<b>µSv/a</b>	µ = a metric prefix meaning 10 <sup>-6</sup> (one millionth); Sv = Sievert (an SI unit used for measuring the effective (or "equivalent") dose of radiation received by a human or some other living organism.) per a = an international symbol for year
<b>ARD</b>	Acid rock drainage
<b>As</b>	Arsenic
<b>cm</b>	Centimetre
<b>CSIR</b>	South African Council for Scientific & Industrial Research
<b>DEA</b>	Directorate of Environmental Affairs (MET)
<b>DRFN</b>	Desert Research Foundation of Namibia
<b>EAP</b>	Environment Assessment Policy of 1994
<b>EIA</b>	Environmental Impact Assessment
<b>EMP</b>	Environmental Management Plan
<b>F</b>	Fluorine
<b>FPR</b>	Final Product Recovery
<b>GDP</b>	Gross Domestic Product
<b>Grindrod Limited</b>	Lessee to Namport for the Bulk Terminal facility in the Port of Walvis Bay
<b>H<sub>2</sub>S</b>	Hydrogen Sulphide
<b>H<sub>2</sub>SO<sub>4</sub></b>	Sulphuric Acid
<b>ha</b>	Hectares
<b>HCl</b>	Hydrochloric Acid
<b>Hg</b>	Mercury
<b>HIA</b>	Heritage Impact Assessment
<b>HIV/AIDS</b>	Human Immune Virus / Acquired Immune Deficiency Syndrome
<b>I&amp;APs</b>	Interested and Affected Parties
<b>IAEA</b>	International Atomic Energy Agency
<b>ICRP</b>	International Council for Radiological Protection
<b>ISO 14 001 EMS</b>	International Standards Organisation 14001 Environmental Management System
<b>IUCN</b>	The World Conservation Union
<b>kg.t-1</b>	One kilogramme per tonne
<b>kg/t</b>	Kilograms per tonne
<b>km</b>	Kilometres
<b>km/h</b>	Kilometres per hour
<b>kt/a</b>	Kilotonnes per annum
<b>kV</b>	Kilovolts
<b>kWh</b>	Kilo Watt hour
<b>m</b>	Metres
<b>m<sup>3</sup></b>	Cubic metres
<b>m<sup>3</sup>/day</b>	Cubic metres per day
<b>m<sup>3</sup>/h</b>	Cubic metres per hour
<b>mamsl</b>	Metres above mean sea level

<b>MET</b>	Ministry of Environment and Tourism (national environmental authority)
<b>MET:DEA</b>	Ministry of Environment and Tourism's Directorate of Environmental Affairs
<b>mg</b>	Milligrams
<b>mg.Nm-3</b>	Milligrams per normal cubic meter
<b>mm</b>	Millimetres
<b>Mm<sup>3</sup></b>	Million cubic metres
<b>MME</b>	Ministry of Mines and Energy
<b>mSv/a</b>	Millisieverts per annum
<b>Mt</b>	A metric unit of mass or weight equal to one million metric tons
<b>MW</b>	Megawatt
<b>N\$</b>	Namibian Dollar
<b>Namport</b>	Namibian Ports Authority
<b>Nampower</b>	Namibian Power Utility (electricity generation and supply)
<b>Nm<sup>3</sup></b>	Normal Cubic Meter (a unit of mass for gases equal to the mass of 1 cubic meter at a pressure of 1 atmosphere and at a standard temperature, often 0 °C or 20 °C)
<b>NOx</b>	Nitrogen Oxides
<b>O<sub>2</sub></b>	Oxygen
<b>PID</b>	Public Information Document
<b>ppm</b>	Parts per million
<b>PPP</b>	Public Participation Process
<b>PRU</b>	Physiographic Rating Units
<b>RUL</b>	Rössing Uranium Limited
<b>SAIEA</b>	Southern African Institute for Environmental Assessment
<b>SAPP</b>	Southern African Power Pool
<b>Se</b>	Selenium
<b>SEIA</b>	Social and Environmental Impact Assessment
<b>SEIR</b>	Social and Environmental Impact Report
<b>SEMP</b>	Social and Environmental Management Plan
<b>SO<sub>2</sub></b>	Sulphur Dioxide
<b>SO<sub>3</sub></b>	Sulphur Trioxide
<b>t</b>	Tonnes
<b>ToR</b>	Terms of Reference
<b>tpd</b>	Tonnes per day
<b>U<sub>3</sub>O<sub>8</sub></b>	Uranium Oxide
<b>US\$</b>	American Dollar
<b>V<sub>2</sub>O<sub>5</sub></b>	Vanadium Pentoxide

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## EXECUTIVE SUMMARY

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### BACKGROUND AND INTRODUCTION

Rössing Uranium Limited (RUL) has operated an open pit uranium mine in the Erongo Region of Namibia since 1976. As a result of an increase in uranium prices on the international market in recent years, RUL is able to consider the possible financial benefit from an expansion of its operations. The anticipated closure date of the Rössing uranium mine is consequently being re-evaluated in terms of overall feasibility, i.e. including social and environmental criteria.

The maximum extent of the envisaged expansion would entail the opening of two new pits, with concomitant new disposal areas for waste rock, new or expanded processing plants, additional tailings dam capacity, and an increase in staff numbers and facilities. In terms of the Namibian Constitution and related environmental legislation, in particular the Environmental Assessment Policy and the Minerals Act, the proposed expansion activity would require authorisation from the responsible authorities before it can be undertaken. A Social and Environmental Impact Assessment (SEIA) has thus been commissioned by RUL for their proposed expansion project.

The present Scoping stage will be followed by the SEIA Report stage, which will culminate in a comprehensive document, the Social and Environmental Impact Report.

This Scoping Report comprises the following:

- A contextualisation of the policy, legislative and methodological frameworks within which the SEIA needs to be undertaken;
- A description of the proposed activities that form the subject of the SEIA process;
- A detailed description of the affected environment;
- A description of the possible social and environmental impacts that have been identified to date;
- A detailed description of the public participation process that underpins the current SEIA; and
- An identification of alternatives, a description of aspects recommended for further study during the subsequent SEIA Report stage, and a recommended way forward to the next stage of the process.

### PROJECT DESCRIPTION

It is foreseen that the expansion project will comprise two phases. The subject of the present Scoping Report is part of Phase 1 of the SEIA and addresses the following components:

- The establishment of an on-site sulphur burning sulphuric acid production plant with associated sulphur storage and transportation between Walvis Bay and the Rössing mine by rail;

- The establishment of a radiometric ore sorter plant with associated reject rock disposal facilities;
- An open pit development known as SK4, within the larger area designated as SK;

The remaining expansion project components will be dealt with as Phase 2 of the SEIA and will be subjected to a separate process and different programme. Interested and Affected Parties (I&APs) registered for the present Phase 1 of the SEIA will be kept informed once the Phase 2 process is launched.

## THE PUBLIC PARTICIPATION PROCESS

Engagement with I&APs forms an integral component of the SEIA process. I&APs will have an opportunity at various stages throughout the SEIA process to gain more knowledge about the proposed project and to provide input into the process.

Stakeholders and I&APs have had several opportunities to participate in the Scoping stage of the present SEIA process and the useful inputs received are acknowledged. The following are the most noteworthy of the issues raised by I&APs to date, as derived from records of stakeholders' inputs:

- Employment opportunities;
- Workplace health and safety concerns, including air and water pollution and noise;
- Housing implications;
- Services such as schools, medical care and water availability;
- Effects on the regional and local economy, including tourism;
- Negative social impacts from newcomers seeking work;
- Possible human and environmental threats from transporting, storing and processing sulphur and sulphuric acid, in and between Walvis Bay and the mine site;
- Possible dust and noise threats to humans and the environment from the ore sorter plant and from the SK4 mining area, including waste rock management;
- Biodiversity implications, particularly in the SK4 mining area;
- Supply, storage, application, runoff and reuse of water, particularly in the SK4 mining area;
- Regional implications of bulk water supply;
- Visual impacts of the acid plant, ore sorter or SK4 mining activities; and
- Energy use.

The objectives of public participation will be maintained throughout this SEIA process. These are to provide information to the public, identify key issues and concerns at an early stage, respond to the issues and concerns raised, provide a review opportunity, and document the process properly,

The proposed project was advertised between 14 and 20 August 2007 in national, regional and local newspapers and on RUL's website, in order to make as many people as possible aware of the project and associated SEIA process. This was done to elicit comment and register I&APs from as broad a spectrum of the public as possible. Once an I&AP has been registered, they will be kept informed of progress throughout the SEIA process.

A Public Information Document (PID) was widely distributed during the initial public participation process and was also available on the website. In addition to the advertising and PID, key stakeholder meetings were held with a wide array of interest groups and organisations. All the issues and comments from these meetings have been noted in response sheets and responded to.

Feedback from three open house and public meetings held in mid-August 2007 have been incorporated into the response sheets and taken into account when finalising the Scoping Report. The Scoping Report will be made available and registered I&APs will be notified of such availability by letter and via media advertising.

During the SEIA stage that will follow the present Scoping stage, public participation and engagement will comprise the following:

- engage with I&APs who were not able to attend the Scoping stage participation process,
- present the findings of the draft SEIA Report,
- register any additional I&APs,
- note and respond to questions and/ or issues of concern, and
- investigate issues at greater depth where the need for this has been indicated.

All I&APs will be informed of the availability of the draft SEIA Report, the period for review and the venues where the report will be available.

## PROJECT LEVEL ALTERNATIVES

The following alternatives have been identified during the Scoping stage of the SEIA process, to be taken forward to the next stage for detailed assessment:

- Acid plant and related handling, storage and transport of sulphur feedstock:
  - Design of handling and storage facility in Port of Walvis Bay
  - Design of rail wagons required for sulphur transport
  - Stack height of acid plant
- Radiometric ore sorter plant:
  - Vertical or horizontal arrangement of pre-screening units
  - Suitable disposal site for reject rock
- SK4 ore body:
  - Haul road design and alignment
  - Waste disposal
  - Water management

These aspects of the listed SEIA project components will be subjected to the consideration and evaluation of alternatives in the assessment stage of the process. The aspects that do not have alternatives will nevertheless also need to be assessed. This will be done by means of determining that acceptable levels of mitigation are available, or by confirming that the best available environmental design or practice is being applied.

## IDENTIFIED IMPACTS

Apart from the screening of alternatives, the present scoping has identified several potential impacts that are proposed to be assessed in the next stage. Each of these impacts or issues will be the subject of a specialist study. The following areas of specialisation have been identified for detailed assessment in the next stage:

- Socio-economic impacts;
- Air quality study;
- Quantitative risk assessment;
- Visual impact assessment
- Radioactivity and public dose assessment;
- Biodiversity;
- Archaeology (i.e. heritage);
- Water resource management;
- Noise and vibration study; and
- Mineral waste and tailings management.

Specifically, the Scoping Report has determined the scope of work and level of detail of each of the above investigations. The proposed scope of work for the specialist studies are provided and the mitigation measures that will be proposed will inform construction and operational phase Social and Environmental Management Plans.

## CONCLUSION AND WAY FORWARD

This Scoping Report has been informed by the issues and concerns raised by the public participation process to date, as well as issues raised by authorities, the proponent (RUL) and by the environmental team. It has presented the context and rationale for the project, described the project components and screened the suite of possible alternatives and environmental impacts.

With the Scoping Report now in the public domain, and having been submitted to the Ministry of Environment and Tourism's Directorate of Environmental Affairs for their consideration, the process can move into the SEIA stage.

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**9 November 2007**

# 1 INTRODUCTION AND BACKGROUND

## 1.1 INTRODUCTION

Rössing Uranium Limited (RUL) has operated an open pit uranium mine in the Erongo Region of Namibia since 1976. Figure 1 provides a locality map for the mine. Although of considerable extent, the Rössing ore body is of a low grade and consequently large volumes of rock have to be mined and processed to extract the powdered uranium concentrate that is the final product.

As a result of an increase in uranium prices on the international market in recent years, RUL is able to consider the possible financial benefit from an expansion of its operations. The previous mine plan predicted an operational period ending in the year 2016. According to this plan, a sustainability assessment was undertaken and approved in 2005. RUL is now looking at a 2026 mine plan and consequently, the associated environmental and social issues will be reviewed.

The maximum extent of the envisaged expansion would entail, in summary, the opening of two new pits, with concomitant new disposal areas for waste rock, new or expanded processing plants, additional tailings dam capacity, and an increase in staff numbers and facilities.

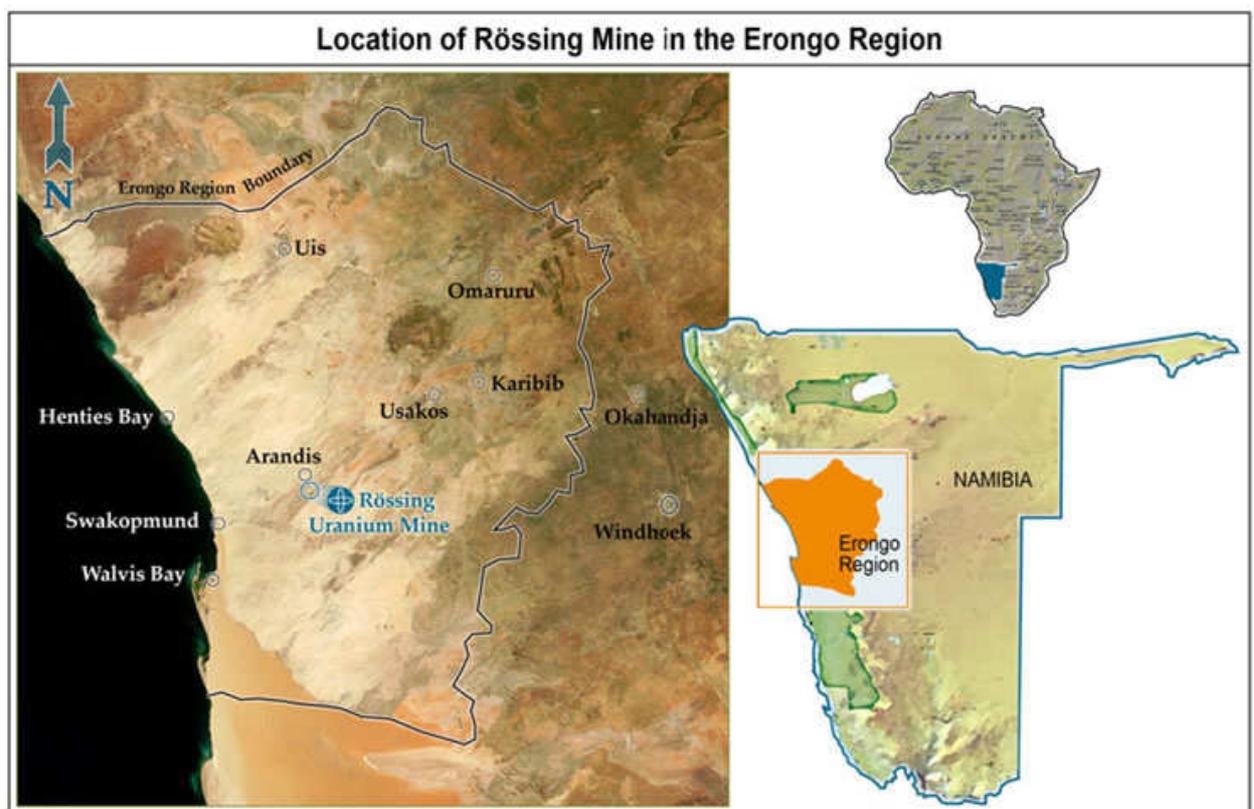


Figure 1: Locality map (source RUL)

In terms of the Namibian Constitution (GRN 1990) and related environmental legislation, in particular the Environmental Assessment Policy (MET 1995) and the Minerals Act (No. 33 of 1992), the proposed expansion activity would require authorisation from the responsible authorities before it can be undertaken. Insofar the environmental acceptability of RUL's proposed expansion project is concerned, the Ministry of Environment and Tourism's Directorate of Environmental Affairs (MET:DEA) would need to issue a clearance for such expansion.

A Social and Environmental Impact Assessment (SEIA) has thus been commissioned by RUL for their proposed expansion project, as required by the Environmental Assessment Policy (MET 1995) but also informed by the principles of Namibia's Environmental Assessment and Management Act, as well as the internal standards and guidelines prescribed by Rio Tinto, RUL's parent company. MET:DEA's clearance would be based on the outcomes of the SEIA and this report serves to document the Scoping stage of the SEIA process. Once MET:DEA has issued a clearance for the project, the responsible sector ministry, i.e. the Ministry of Mines and Energy (MME), will be able to consider awarding the necessary mining licence to RUL.

It is important to note that only three specific components of RUL's expansion project are the subject of the present Scoping Report, viz. a **sulphuric acid plant** and associated storage and transport, a radiometric **ore sorter plant** and the mining of an ore body known as **SK4**. These components are referred to as Phase 1 of RUL's expansion project. The remaining expansion project components, as described in Section 1.5 below and referred to as Phase 2, will be dealt with in a separate process that is subject to a different programme. I&APs registered for the present Phase 1 of the SEIA will be kept informed once the Phase 2 process is launched.

The SEIA process and its sequence of supportive documentation, as envisaged for the specified components of RUL's expansion project, are illustrated in Figure 2 below.

This Scoping Report comprises the following:

- A contextualisation of the policy, legislative and methodological frameworks within which the SEIA needs to be undertaken, i.e. an overview of the legal requirements which have necessitated the assessment, as well as a review of other current/ pending legal requirements that have a bearing on the activity, as well as the obligations associated with the various protocols/ conventions to which RUL subscribes.
- A description of the proposed activities that form the subject of the SEIA process, i.e. details of the processes envisaged, which also considers alternative project actions.
- A detailed description of the affected environment and an overview of the findings of previous and current prefeasibility and planning studies, assessments that have been undertaken in the past and other specialist studies.
- A description of the possible social and environmental impacts that have been identified to date, i.e. during the present Scoping stage, and the means whereby such impacts will be subjected to methodological evaluation during the subsequent SEIA Report stage, insofar their significance, mitigation potential and possible acceptance are concerned.
- A detailed description of the public participation process that underpins the current SEIA.

- An identification of alternatives, a description of aspects recommended for further study during the subsequent SEIA Report stage, and a recommended way forward to the next stage of the process.

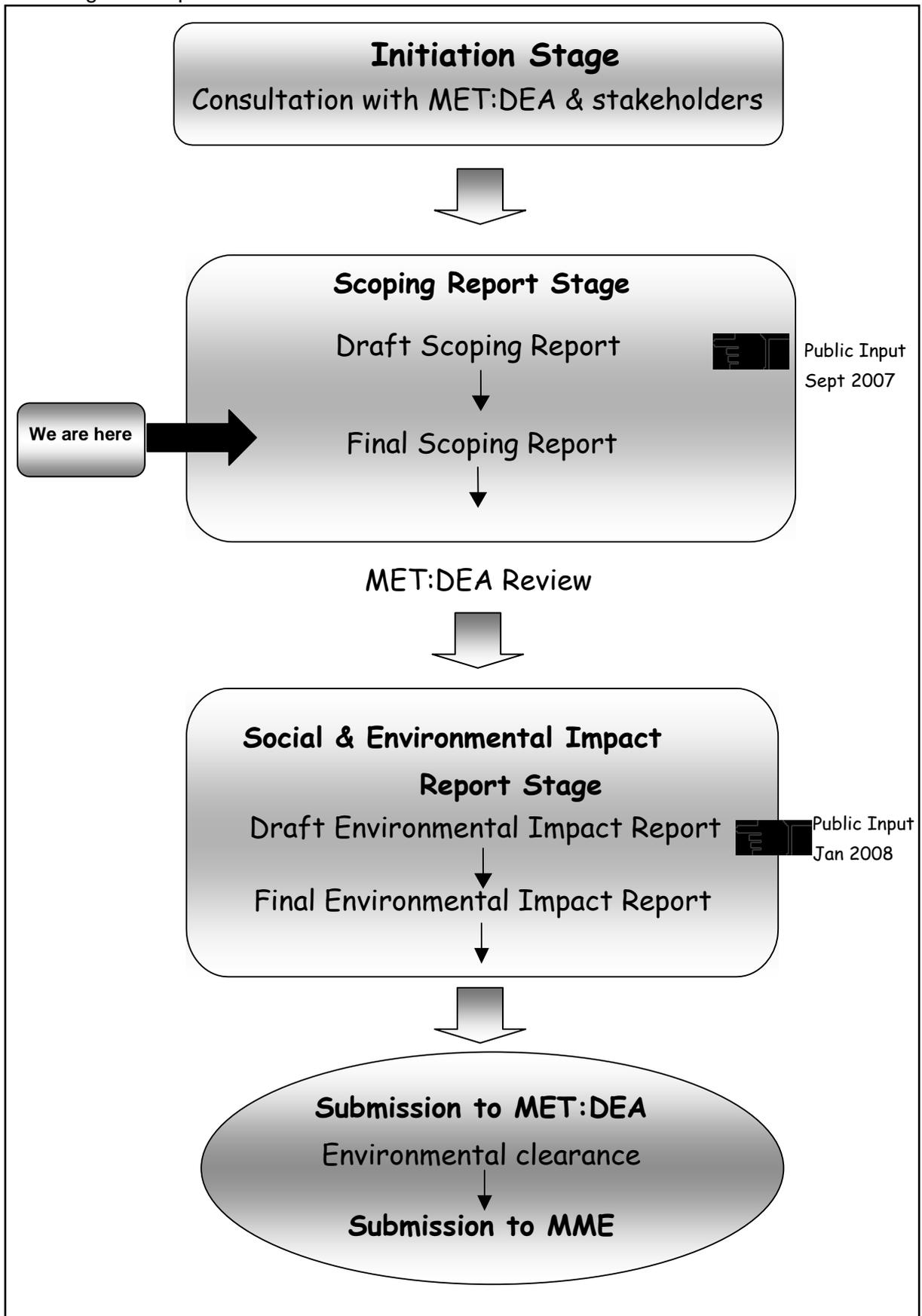
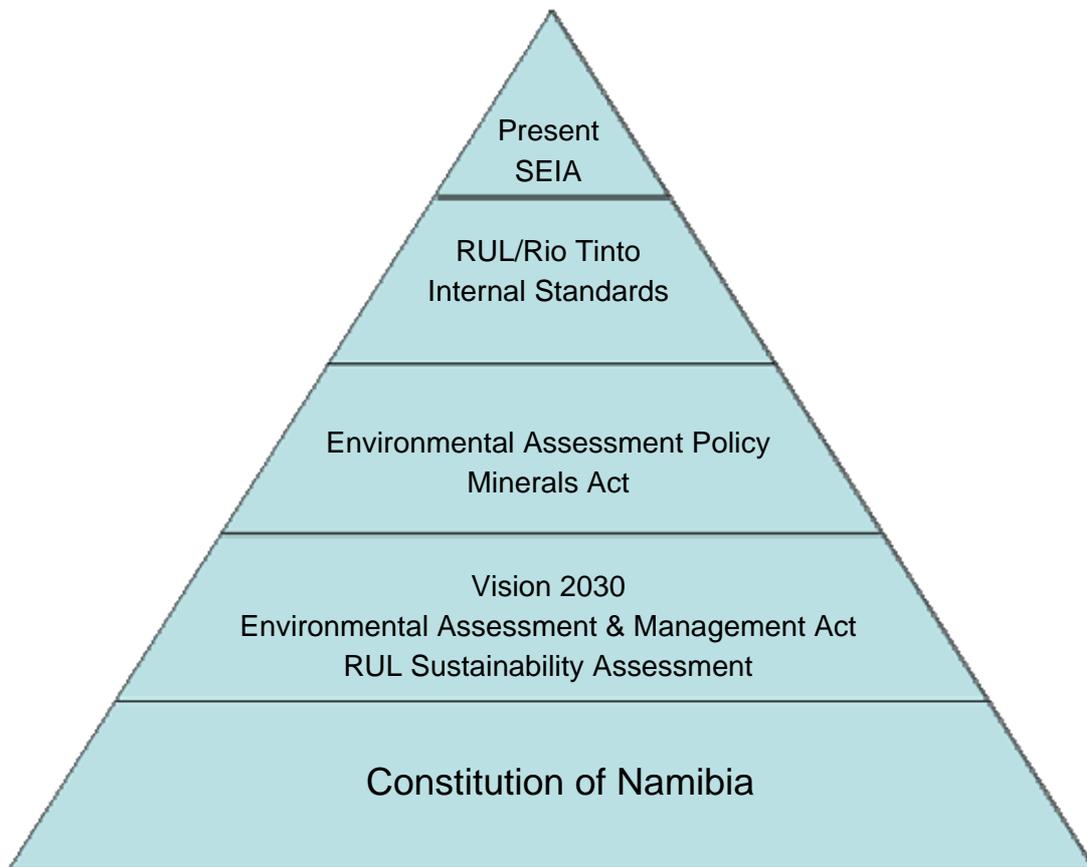


Figure 2: The SEIA process

As mentioned, the present Scoping stage will be followed by the SEIA Report stage, which will culminate in a comprehensive document, the Social and Environmental Impact Report (SEIR). A Social and Environmental Management Plan (SEMP), as described in Sections 6.1 and 6.2 below, will be included in the SEIR, to provide a comprehensive amount of information for MET:DEA and MME to base their consideration of the proposed developments on.

## 1.2 POLICY FRAMEWORK

As a significant contributor to the Namibian economy<sup>1</sup>, RUL's role in local and regional economic development necessitates demonstrable adherence to sound environmental practices. The decision to pursue possible expansion of their operations thus needed to be underpinned by informed strategic planning. To this end, the following hierarchy of policy, planning and procedural documentation (Figure 3) reflects the point of departure for the proposed expansion project:



**Figure 3: Hierarchy of policy and planning documents**

The strategic policy and planning documents reflected in Figure 3 above are now briefly described. Regulated procedural requirements are dealt with in more detail in Section 1.3 below, together with other standards, conventions and pending legislation.

<sup>1</sup> In 2001 RUL contributed 2.5% of Namibia's Gross Domestic Product (GDP) and 10% of the country's export earnings (Sustainability Assessment 2004).

### 1.2.1 The Constitution of the Republic of Namibia

There are two clauses contained in the Namibian Constitution that are of particular relevance to sound environmental management practice, viz. articles 91(c) and 95(l). In summary, these refer to:

- guarding against over-utilisation of biological natural resources;
- limiting over-exploitation of non-renewable resources;
- ensuring ecosystem functionality;
- protecting Namibia's sense of place and character;
- maintaining biological diversity; and
- pursuing sustainable natural resource use.

The State is thus committed to actively promoting and maintaining the environmental welfare of Namibians by formulating and institutionalising policies that can realise the above-mentioned sustainable development objectives. As an important role-player in the beneficiation of Namibia's non-renewable mineral resources, RUL has demonstrated its alignment with these constitutional principles.

### 1.2.2 Vision 2030

The principles that underpin Vision 2030<sup>2</sup>, a policy framework for Namibia's long-term national development, comprise the following:

- good governance;
- partnership;
- capacity enhancement;
- comparative advantage;
- sustainable development;
- economic growth;
- national sovereignty and human integrity;
- environment; and
- peace and security.

In pursuing the further development of the uranium resources available to it, RUL is in a position to contribute significantly to the realisation of the Vision 2030 principles.

### 1.2.3 Environmental Assessment and Management Act

In giving effect to articles 91(c) and 95(l) of the Constitution of Namibia, general principles for sound management of the environment and natural resources in an integrated manner have been formulated. This has resulted in an Environmental Assessment and Management Act

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<sup>2</sup> Derived from Namibia's Green Plan drafted by MET in 1992 and followed by the sequence of National Development Plans.

being approved by the Namibian Parliament in October 2007<sup>3</sup>. Part 1 of the Environmental Assessment and Management Act describes the various rights and obligations that pertain to citizens and the Government alike, including an environment that does not pose threats to human health, proper protection of the environment, broadened *locus standi* on the part of individuals and communities, and reasonable access to information regarding the state of the environment.

Part 2 of the Act sets out 13 principles of environmental management, as follows:

- Renewable resources shall be utilised on a sustainable basis for the benefit of current and future generations of Namibians.
- Community involvement in natural resource management and sharing in the benefits arising therefrom shall be promoted and facilitated.
- Public participation in decision-making affecting the environment shall be promoted.
- Fair and equitable access to natural resources shall be promoted.
- Equitable access to sufficient water of acceptable quality and adequate sanitation shall be promoted and the water needs of ecological systems shall be fulfilled to ensure the sustainability of such systems.
- The precautionary principle and the principle of preventative action shall be applied.
- There shall be prior environmental assessment of projects and proposals which may significantly affect the environment or use of natural resources.
- Sustainable development shall be promoted in land-use planning.
- Namibia's movable and immovable cultural and natural heritage, including its biodiversity, shall be protected and respected for the benefit of current and future generations.
- Generators of waste and polluting substances shall adopt the best practicable environmental option to reduce such generation at source.
- The polluter pays principle shall be applied.
- Reduction, reuse and recycling of waste shall be promoted.
- There shall be no importation of waste into Namibia.

As reflected in the policy statement described in Section 1.3.3 below, there is a clear commitment to pursuing these principles of environmental management on the part of RUL as the proponent of the expansion project.

#### 1.2.4 RUL Sustainability Assessment

In determining the viability of extending the life of the Rössing uranium mine, RUL has undertaken a detailed sustainability assessment (RUL, 2004). This sustainability assessment is in support of the engineering and financial feasibility studies that were the primary informants in considering such an extension of the life of the mine.

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<sup>3</sup> Although approved by Parliament, the Act has yet to be signed into law by the President.

It is important to note that a sustainability assessment considers impacts that may result from a proposed development at a broader level than the site-specific impacts. The aims of the 2004 sustainability assessment were thus to:

- Identify any aspects of the proposed expansion project that could present fatal flaws that could be contrary to any development at all;
- Identify the opinions of all stakeholders and interested and affected parties, insofar any real concerns that emerged could influence the future of the mine;
- Evaluate the risks and benefits of extending the life of the mine to either 2016 or 2026, compared to early closure in 2007; and
- Suggest possible mitigatory measures to minimise potentially negative impacts, as well as means of enhancing the positive impacts that may result from extending the life of the mine.

Developing a measure of sustainability, in terms of quantifying the net social and environmental<sup>4</sup> benefit or decrement of the proposed expansion project, thus allowed RUL to consider the next step in the development process, *viz.* whether the project could be implemented within acceptable environmental parameters. The sustainability assessment is consequently a vital strategic informant in the pursuance of the present SEIA.

### 1.3 LEGAL REQUIREMENTS, STANDARDS AND CONVENTIONS

In order to protect the environment and ensure that RUL's proposed expansion project is undertaken in an environmentally responsible manner, there are two significant pieces of environmental legislation that focus this assessment, *viz.* Namibia's Environmental Assessment Policy and the Minerals Act. These are reflected below, followed by reference to other legislation, standards and conventions that may prove to be relevant.

#### 1.3.1 Namibia's Environmental Assessment Policy of 1994

Appendix B of Namibia's Environmental Assessment Policy contains a schedule of activities that may have significant detrimental effects on the environment and which require authorisation from MET:DEA. The nature of RUL's proposed expansion project includes activities listed in this schedule. The primary triggers<sup>5</sup> are, *inter alia*:

- “10~ Transportation of hazardous substances and radioactive waste
- 11~ Mining, mineral extraction and mineral beneficiation
- 12~ Power generation facilities with an output of 1MW or more
- 14~ Storage facilities for chemical products
- 15~ Industrial installation for bulk storage of fuels
- 36~ Water intensive industries
- 39~ Effluent plants

<sup>4</sup> Note that the term “environment” in this sense is understood to refer to the total environment, i.e. to encompass both biophysical as well as socio-economic aspects.

<sup>5</sup> Given the complex nature of the proposed expansion project, other activities may also serve as triggers. However, the comprehensive SEIA as envisaged will address all of the identified impacts.

- 46~ *Chemical production industries*  
50~ *Waste disposal sites*

Accordingly, the proposed expansion project requires authorisation from MET:DEA, and will be based on the findings of the present SEIA process. The envisaged SEIA process will accord with the requirements of such processes as described in Appendix A of the Environmental Assessment Policy.

### 1.3.2 Namibia's Minerals Act of 1992

A provision of the Minerals Act, specifically Section 48 (2) (b) (i) of the Act, is that "*environmental impact studies*" may be called for by the Minister of Mines and Energy when mineral licences - or their renewal or transfer - are applied for.

RUL are presently operating under a mining licence issued by MME and this will remain unaffected for the current mining operation. However, as the responsible sector ministry, MME will consider awarding the necessary mining license for RUL's expansion project, once MET:DEA has issued environmental clearances. Copies of this Scoping Report, as well as the subsequent SEIA Report, will thus be submitted to the Ministry for their decision-making regarding mining licences for the expanded mining operation.

### 1.3.3 RUL/Rio Tinto's Internal Standards

Rio Tinto, RUL's parent company, operates a comprehensive Environmental Management System (EMS) that accords with international standards of best practice. An array of environmental standards are thus in place and all Rio Tinto businesses, such as RUL, are committed to maintaining such international standards. Rio Tinto's policy statement titled *The Way We Work* provides the overarching environmental touchstone, while matters of planning, implementation and operation, checking and corrective action, and management review, are embodied in the ISO 14 001 EMS that each business is obliged to maintain. Certification per the ISO 14 001 EMS standard was obtained by RUL in 2000. Recertification was obtained in 2004 and 2007.

Specifically as it relates to the proposed expansion project, the planning component of RUL's EMS requires that the project is treated as a new activity and is thus subjected to "*...previous identification of (its) environmental aspects and impact assessment...*" and that the assessment of the project is measured against related environmental performance indicators. This may be interpreted as an explicit intention to undertake the present SEIA in accordance with international best practice.

### 1.3.4 Other legislation and conventions

In addition to the Environmental Assessment Policy, the Minerals Act and RUL's internal standards described above, the following additional pieces of existing or pending legislation and conventions may have some bearing on the proposed expansion project:

- The socio-economic environment~
  - National Heritage Act (2004)
  - Primary Health Care Policy (1990)
  - National Code on HIV/AIDS and Employment (1996)
  - Marriage Equality Act (2002)
  - Combating of Rape Act (2002)
  - National Employment Policy (1997)
  - Decentralisation Policy (1998)
  - Pending Minerals Safety Bill
  - Pending Atomic Energy Board and Radiation Protection Authority Bill
  - International Atomic Energy Agency Non-proliferation Treaty (1970)
  
- The biophysical environment~
  - Water Act (1956) and cf. pending Water Bill
  - Atmospheric Pollution Prevention Ordinance (1976) and cf. pending Pollution Control and Waste Management Bill
  - Draft Minerals Policy (2002)
  - Ramsar Convention (1975)
  - Convention on Biological Diversity (2000)
  - Convention to Combat Desertification (1997)
  - United Nations Framework Convention on Climate Change (1992)

The extent to which these pieces of legislation and conventions may be relevant to the undertaking of the present SEIA will become clear as the process unfolds. Other government departments that may need to provide comment on the SEIA, such as the Department of Water Affairs of the Ministry of Agriculture, Water and Rural Development, will be provided with copies of this Scoping Report and the subsequent SEIA Report.

## 1.4 THE BRIEF

Rössing Uranium Limited has appointed Ninham Shand Consulting Services as the independent lead consultant to assess the environmental impacts of their proposed expansion project. Importantly, the appointment is also to ensure that RUL as the proponent complies with the legislated requirements of environmental assessment processes as mentioned in Section 1.3.1 above. As per the legislated Environmental Assessment Policy and international best practice, the lead environmental consultant would be responsible for ensuring that the following are undertaken:

- Consultation with the responsible authorities and stakeholders early in the process, to confirm that the envisaged approach and methodology are appropriate and that the proposed development has been correctly screened to determine the acceptable level of assessment to be undertaken.

- Compilation of a Scoping Report that contextualises policy and legislation relative to the proposed development, describes the proposed activities, describes the affected environment, describes the possible environmental impacts, reports on the public participation process, and identifies aspects that require further or specialist study during the subsequent assessment stage.
- Submission of the Scoping Report to MET:DEA for their review and acceptance prior to embarking on the SEIA Report stage.
- Compilation of a SEIA Report that provides, in addition to the information contained in the Scoping Report, a detailed description of the potential impacts associated with the proposed development, the findings of the specialist studies, an evaluation of the significance of the potential impacts, and recommendations regarding mitigation and a way forward.
- Submission of the SEIA Report to MET:DEA for their clearance before MME consider issuing a mining licence.

A public participation process is being undertaken throughout this study, to ensure that interested and affected parties (I&APs) are given an opportunity to participate and to allow them to be certain that issues of importance to them are addressed. This is discussed in more detail in Chapter 6 of this report.

## 1.5 STUDY APPROACH AND METHODOLOGY

To initiate the SEIA process, early consultation with the Head of the Environmental Impact Assessment Unit at MET:DEA, Dr F Sikabongo, took place in a meeting held on 28 August 2007. A copy of the letter of confirmation of the proceedings of the meeting is attached as Annexure B. This serves as the necessary registration and screening of the SEIA in question, and confirms MET:DEA's acceptance of the envisaged approach.

As mentioned in Section 1.1 above, three specific components comprise Phase 1 of RUL's expansion project and are the subject of the present Scoping Report, viz.:

- a **sulphuric acid plant** and associated storage and transport;
- a radiometric **ore sorter plant**; and
- the mining of an ore body known as **SK4**.

These are described in detail in Section 2 below, but it is important to recognise that the remaining expansion project components will be dealt with as Phase 2 of the SEIA, and be subjected to a separate process and to a different programme. The reason for separating these components is that their engineering design has not yet progressed far enough to allow for the assessment stage of the SEIA to be undertaken. However, sufficient preliminary information is available at this time to allow for scoping. This will ensure that social and environmental issues are identified early enough in the SEIA process to meaningfully influence the engineering design. For information, the remaining expansion project components that will be addressed during the Phase 2 SEIA comprise the following:

- an open pit development of the remainder of the SK ore body;
- an open pit development of the ore body in the area designated as SH;
- the development of a heap leaching facility;
- the establishment of a vacuum belt filter plant within the existing plant area;
- the development of alternate processing facilities with their associated processing plant infrastructure;
- new rock waste disposal facilities in undisturbed areas; and
- new tailings disposal facilities in undisturbed areas.

To meet RUL's timeframes in terms of the sequencing of approvals and phasing of assessment activities for Phase 1, viz. the SEIA for the acid plant, ore sorter plant and mining area SK4 by January 2008, the following work programme is envisaged:

Activity	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Project inception							
Public meetings for Scoping							
Authority & stakeholder consultation							
Draft Scoping Report							
Finalise & submit Scoping Report							
Specialist site visit							
Specialist reports							
Draft SEI Report (SEIR)							
Review & public meetings for SEIR							
Finalise & submit SEIR							

However, it is recognised that such a programme could be affected by the vagaries of the environmental assessment process, in particular the public consultation process, consultation with RUL's engineering design team, authorities and stakeholders, and the receipt of specialist input.

A standardised and internationally recognised methodology<sup>6</sup> will be applied to assess the significance of the potential environmental impacts of RUL's expansion 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 RUL as the proponent, and their acceptance and approval ultimately with MET:DEA and MME. The SEIA Report will explicitly describe RUL's commitments in this regard. The tables on the following pages show the scale used to assess these variables, and defines each of the rating categories.

<sup>6</sup> As described, *inter alia*, in the South African Department of Environmental Affairs and Tourism's Integrated Environmental Management Information Series (CSIR, 2002).

### Assessment criteria for the evaluation of impacts

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	<b>Regional</b>	Beyond a 20 km radius of the impact site
	<b>Local</b>	Within a 20 km radius of the centre of the impact site
	<b>Site specific</b>	On site or within 100 m of the impact site
Magnitude of impact (at the indicated spatial scale)	<b>High</b>	Natural and/ or social functions and/ or processes are <i>severely</i> altered
	<b>Medium</b>	Natural and/ or social functions and/ or processes are <i>notably</i> altered
	<b>Low</b>	Natural and/ or social functions and/ or processes are <i>slightly</i> altered
	<b>Very Low</b>	Natural and/ or social functions and/ or processes are <i>negligibly</i> altered
	<b>Zero</b>	Natural and/ or social functions and/ or processes remain <i>unaltered</i>
Duration of impact	<b>Construction period</b>	Up to 7 years
	<b>Medium Term</b>	Up to 10 years after construction
	<b>Long Term</b>	More than 10 years after construction

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 as a means of minimising subjectivity in such evaluations, i.e. to allow for replicability in the determination of significance.

### Definition of significance ratings

SIGNIFICANCE RATINGS	LEVEL OF CRITERIA REQUIRED
<b>High</b>	<ul style="list-style-type: none"> <li>High magnitude with a regional extent and long term duration</li> <li>High magnitude with either a regional extent and medium term duration or a local extent and long term duration</li> <li>Medium magnitude with a regional extent and long term duration</li> </ul>
<b>Medium</b>	<ul style="list-style-type: none"> <li>High magnitude with a local extent and medium term duration</li> <li>High magnitude with a regional extent and construction period or a site specific extent and long term duration</li> <li>High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration</li> <li>Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term</li> <li>Low magnitude with a regional extent and long term duration</li> </ul>
<b>Low</b>	<ul style="list-style-type: none"> <li>High magnitude with a site specific extent and construction period duration</li> <li>Medium magnitude with a site specific extent and construction period duration</li> <li>Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term</li> <li>Very low magnitude with a regional extent and long term duration</li> </ul>
<b>Very low</b>	<ul style="list-style-type: none"> <li>Low magnitude with a site specific extent and construction period duration</li> <li>Very low magnitude with any combination of extent and duration except regional and long term</li> </ul>
<b>Neutral</b>	<ul style="list-style-type: none"> <li>Zero magnitude with any combination of extent and duration</li> </ul>

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.

### Definition of probability ratings

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

### Definition of confidence ratings

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

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

### Definition of reversibility ratings

REVERSIBILITY RATINGS	CRITERIA
<b>Irreversible</b>	The activity will lead to an impact that is permanent.
<b>Reversible</b>	The impact is reversible, within a period of 10 years.

## 1.6 ASSUMPTIONS AND LIMITATIONS

The SEIA process that this Scoping Report is in support of is limited to the specific elements of the Phase 1 expansion project detailed in Section 2 and will be undertaken in terms of Namibia's Environmental Assessment Policy and internationally recognised best practice in environmental assessment. In developing the approach to this project, Ninham Shand took cognisance of RUL's deliberations regarding their Life of Mine Expansion Options Analysis and the earlier Sustainability Assessment.

Specific assumptions that have been made are:

- Regarding the assessment of relevant project-level alternatives, it is assumed that, where appropriate, two or three discrete, detailed and well-defined alternatives for particular project components will be attended to. Section 4 below deals with alternatives in more detail.
- Regarding the technical and specialist information required during the SEIA Report stage, it is assumed that such information will be based on the latest available data, is as accurate as possible and is made available timeously.

- Due to the complexity of the present SEIA in terms of the variety of different components being addressed and the sequencing of related engineering design, there may be cases where the available information is incomplete or not available timeously. Where such information gaps are inimical to the assessment, they will be clearly identified. However, where the subject matter is well understood and not critical to the assessment, provision will be made for their inclusion in the decision-making process in the Social and Environmental Management Plan (SEMP) that will accompany the SEIA Report.
- It is recognised that Grindrod Limited, the lessee of the site in the Port of Walvis Bay where a Grindrod subsidiary, API<sup>7</sup>, erected and have operated for the last twelve years a bulk handling terminal, will be undertaking an environmental assessment for their proposed elemental sulphur handling and storage facility in the harbour. As the landlord of the Grindrod bulk handling terminal, Namport will have a role to play in this assessment. The present SEIA will nevertheless include this facility in its scope, to accord with best practice insofar assurance of acceptable environmental and health and safety standards on the part of RUL's commercial suppliers is concerned. There is an agreement in place to co-ordinate the two assessment processes and the findings from the present SEIA that relate to the sulphur handling and storage facility in the harbour will be made available to the environmental assessment practitioner that undertakes the task for Grindrod Limited.
- While external review will be carried out by the Southern African Institute for Environmental Assessment, Ninham Shand will also undertake internal review throughout the process. This will be carried out by a recognised expert with particular knowledge of the Rössing site and operations (see Section 1.7 below). In this way, assurance of a world-quality product can be given. Summaries of the two reviews of a draft version of the present Scoping Report are provided in Section 7.

## 1.7 THE PROJECT TEAM

The composition of the professional team that Ninham Shand has assembled to undertake the SEIA in question, and their respective areas of responsibility, is as follows:

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<sup>7</sup> African Portland Industrial Holdings.

Organisation	Area of responsibility Field of expertise	Team member(s)
Ninham Shand (Lead Consultant)	: Project Management : SEIA co-ordination : SEIA process	<u>Brett Lawson</u> (Project Manager) is a certified Environmental Assessment Practitioner, bound by a code of conduct, with considerable environmental management experience. Mr Lawson is also registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions. <u>Patrick Killick</u> (Environmental Practitioner) has an MPhil degree in environmental management and specific experience in the supervision, management and monitoring of construction-related environmental impacts associated with large engineering works, as well as recent experience in environmental assessment practice. <u>Genie De Waal</u> (Technical Assistant) has a National Diploma in Business Computing and 13 years experience in office & project management in an engineering & environmental environment.
The Council for Scientific & Industrial Research (CSIR)	: Technical environmental mining expertise : Internal Review	<u>Brent Johnson</u> of the CSIR will provide technical environmental expertise related to the mining sector. He has a BSc (Hons) degree in Environmental Science and his specific fields of expertise relate to environmental and sustainability assessment and management within the mining and energy sectors. <u>Dr Peter Ashton</u> will undertake an internal review of the SEIA process to ensure that it accords with local and international best practice. He holds a PhD degree and has considerable experience in a wide range of fields, including the assessment of impacts of mining and development projects on aquatic ecosystems. Dr Ashton has undertaken several environmental assessment and water quality studies for RUL since the early nineties.
Airshed Planning Professionals	: Air quality impact assessment	<u>Reneé Thomas</u> is currently completing her Masters degree and has six years experience in the field of air pollution impact assessment and air quality management. She has undertaken numerous air pollution impact studies and has provided extensive guidance to both industry and government on air quality management practices.
RisCom	: Quantitative Risk Assessment	<u>Michael Oberholzer</u> is a registered Professional Engineer and holds a BSc (Chemical Engineering) degree. He has over 20 years experience with Dow chemicals and Sentrachem in all aspects of project implementation. Since leaving Dow, he has completed a number of Risk Assessments studies and Process Hazard Analysis in various industries including offshore assignments in the oil and gas industries, as well as in the chemical, petrochemical, agrochemicals and mining industries.
Visual Resource Management Africa (VRMA)	: Visual impact assessment	<u>Stephen Stead</u> has a BA (Hons) in Human Geography and Geographic Information and has 12 years of experience in the field of GIS mapping and Modelling. Over the last 5 years he has completed approximately 40 Visual Impact Studies throughout South Africa using the well-documented visual impact analysis methodology developed by the Bureau of Land Management in the USA. He has also undertaken numerous studies to identify land use, vegetation and vegetation sensitivity from aerial and satellite imagery.

Other defined tasks or areas of specialisation that have been commissioned or contracted directly by RUL but whose input into the SEIA process will be co-ordinated and relied upon by Ninham Shand, are:

Organisation	Area of responsibility / Field of expertise	Team member(s)
Marie Hoadley (Independent Consultant)	: Public consultation and facilitation : Social impact assessment	<u>Marie Hoadley</u> has a BA degree and is an experienced social impact assessor, having worked on mining projects across Southern Africa. She specialises in working with marginalised mining communities in rural and peri-urban settings and has worked with both artisanal miners and multi-national mining companies. Prior to starting her consulting practice, she worked as a research associate at the School of Mining Engineering, University of the Witwatersrand.
The Southern African Institute for Environmental Assessment (SAIEA)	: Independent external review	<u>Dr Peter Tarr</u> holds a PhD in Environmental Management and has been involved in conservation and environmental management in southern Africa for the past 20 years. He was primarily responsible for developing Namibia's Environmental Assessment Policy. In 2001, he established the SADC regions' first non-profit organisation dedicated to the use of Environmental Assessment (EA) as a front-line tool for promoting sustainable development, SAIEA, and became its founder and Director. SAIEA has overseen over 50 EA processes and studies covering a wide variety of sectors.
The Nuclear Energy Corporation of South Africa (NECSA)	: Radioactivity and public dose assessment	<u>Professor De Beer</u> of NECSA will be undertaking the radioactivity and public dose study. Apart from several ancillary functions, the main functions of NECSA are to undertake and promote research and development in the field of nuclear energy and radiation sciences and technology; to process source material, special nuclear material and restricted material; and to co-ordinate with other organisations in matters falling within these spheres.

Organisation	Area of responsibility / Field of expertise	Team member(s)
Environmental Evaluation Associates of Namibia (EEAN) Pty Ltd (consulting arm of the Desert Research Foundation of Namibia (DRFN))	: Biodiversity study	<p><u>John Pallett</u> has biodiversity experience from his work as mammal curator at the State Museum and more general experience in EIAs conducted through EEAN since 1992. He will be project managing the study.</p> <p><u>Dr John Irish</u> was involved in the mid 1980s RUL EIA work. He now heads Namibia's Biodiversity Database project, and is well familiarised with biodiversity distributional information and computerised spatial recording of endemics. He will provide specialist input into identification of collected species.</p> <p><u>Dr Joh Henschel</u> is Executive Director of Gobabeb Training and Research Centre, a centre for ecological expertise in the Namib. His research record includes specialisation on arachnids in the Namib. He is also involved in the training programmes of Namibian students who undertake practical work at Gobabeb and its field sites. He will provide specialist input into identification of collected species.</p> <p><u>Dr Mary Seely</u> is an internationally recognised expert on the Namib Desert and environmental issues in Namibia and arid regions. She brings an understanding of the bigger picture behind specialised studies such as this project, to assist in review and quality assurance of the project deliverables.</p> <p><u>Veronica Siteteka</u> is based at Gobabeb as a Junior Research Assistant and has recently undertaken GIS training in The Netherlands with particular focus on EIAs. She will compile all the GIS-based information.</p>
Quarternary Research Services	: Archaeology (i.e. heritage)	<p><u>Dr John Kinahan</u> has more than 25 years of professional experience as an archaeologist, with special emphasis on palaeo-environmental research. He has collaborated with numerous international research programmes. Dr Kinahan, in partnership with Jill Kinahan, has carried out more than 75 contract surveys and excavations in Namibia, Botswana, Tanzania, Mozambique, Angola and Ethiopia. Recently, they compiled the application by Namibia for the listing of Twyfelfontein rock art site under the World Heritage Convention.</p>
Rössing Uranium Ltd	: Water resource management	<p><u>Sandra Müller</u> is a highly experienced geohydrologist on the staff of RUL whose professional experience and abilities are well recognized amongst peers. She has been responsible for the monitoring of water management on the mine for many years.</p>

Organisation	Area of responsibility / Field of expertise	Team member(s)
Namibian Vibration Consultants (NVC)	: Noise and vibration study	<p><u>Mr Erwin Smith</u> has specialist vibration experience, particularly in the human vibration area. He will be project managing the study.</p> <p><u>Mr John Hassall</u> has over thirty years experience in the acoustic and vibration field. His areas of expertise include EIAs, environmental and industrial noise surveys, noise control measures, building services noise and vibration control, hearing damage protection measures, and machine condition monitoring and diagnosis using vibration analysis.</p> <p><u>Mr Demos Dracoulides</u> has experience in noise and air pollution dispersion survey and modelling, in particular in the aviation and solid waste management areas. He will assist in the noise monitoring and develop the modelling programme to predict the extent of noise and vibrations generated by the proposed development.</p>
Rio Tinto Technology and Innovation	: Mineral waste and tailings management	The Rio Tinto Excellence in Mineral Waste Management Program has been developed to help operations and projects reduce the environmental, health, financial and reputational risks posed by mineral wastes such as tailings, waste rock and open pits. The program is intended to provide expert technical analysis and guidance outside of the formal corporate assurance framework.

## 1.8 REPORT STRUCTURE

This report is structured as follows:

Chapter One	<i>Provides the introduction, policy and legislative requirements, and approach and methodology for the study</i>
Chapter Two	<i>Describes the project components</i>
Chapter Three	<i>Describes the public participation process</i>
Chapter Four	<i>Describes the selection and screening of alternatives</i>
Chapter Five	<i>Describes the study area</i>
Chapter Six	<i>Discusses the identified impacts</i>
Chapter Seven	<i>Concludes the report and describes the way forward</i>

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## 2 PROJECT DESCRIPTION

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### 2.1 PROPOSED ACTIVITIES

The entire extent of the expansion project proposed by RUL comprises, in summary, the opening of two new pits, with concomitant new disposal areas for waste rock, new or expanded processing plants, additional tailings dam capacity, and an increase in staff numbers and facilities. Clearly, such a wide-ranging expansion project comprises numerous components.

However, as mentioned in Sections 1.1 and 1.5 above, only the sulphur-burning **sulphuric acid plant** and associated storage and transport, the radiometric **ore sorter plant** and associated reject rock disposal, and the development of the **SK4 pit** are being addressed in the present Scoping Report. These components are referred to as Phase 1 of RUL's expansion project. The remaining expansion project components, as described in Section 1.5 above and referred to as Phase 2, will be dealt with in a separate process that is subject to a different programme. I&APs registered for the present Phase 1 of the SEIA will be kept informed once the Phase 2 process is launched.

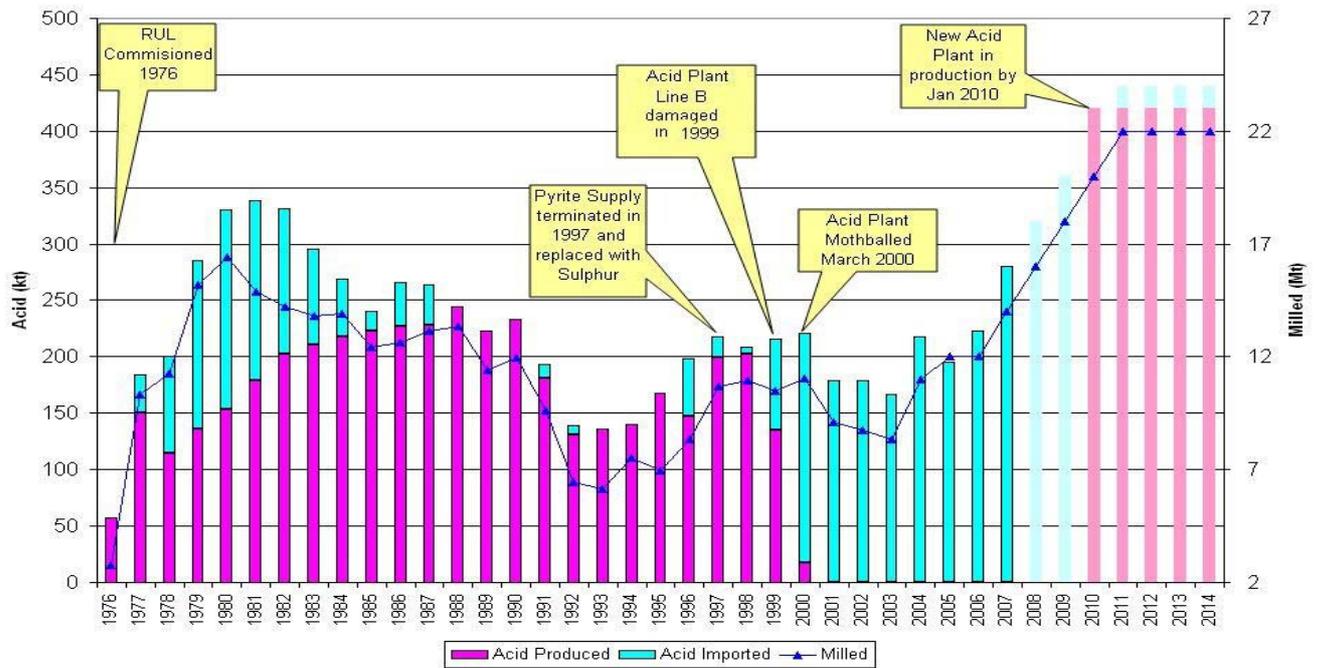
Each of the three components of Phase 1 of RUL's expansion project, i.e. the subject of the present SEIA, is now dealt with in more detail.

### 2.2 ON-SITE SULPHUR BURNING SULPHURIC ACID PRODUCTION PLANT

#### 2.2.1 Context – as provided in the Scope of Work

RUL's metallurgical process uses sulphuric acid leaching to extract the uranium from the ore. An onsite pyrite burning acid plant was commissioned in 1976 to supply acid required on site but was mothballed in 2000 when prices of imported acid fell below production cost. Prior to mothballing, the plant was converted to burn sulphur imported through Walvis Bay and railed to the mine. This was necessary due to the termination of the pyrite supply from the Otjihase Mine. Public concerns were raised when sulphur spillage next to the railway line was found. Some concerned members of the public raised the question whether the material was the uranium oxide "yellow cake" produced by the mine.

Since 2000, the entire mine's acid requirements have been imported via Walvis Bay harbour. An environmental impact assessment for the importation, transportation and storage of acid was conducted by the South African Council for Scientific and Industrial Research (CSIR) in 2000. Current economic evaluations show that value can be gained by establishing a new sulphur burning acid plant at the mine site and continue importing additional acid if required. Figure 4 provides a graphic representation of the acid production time line at RUL since 1976.



**Figure 4: RUL's acid production since 1976** (source RUL)

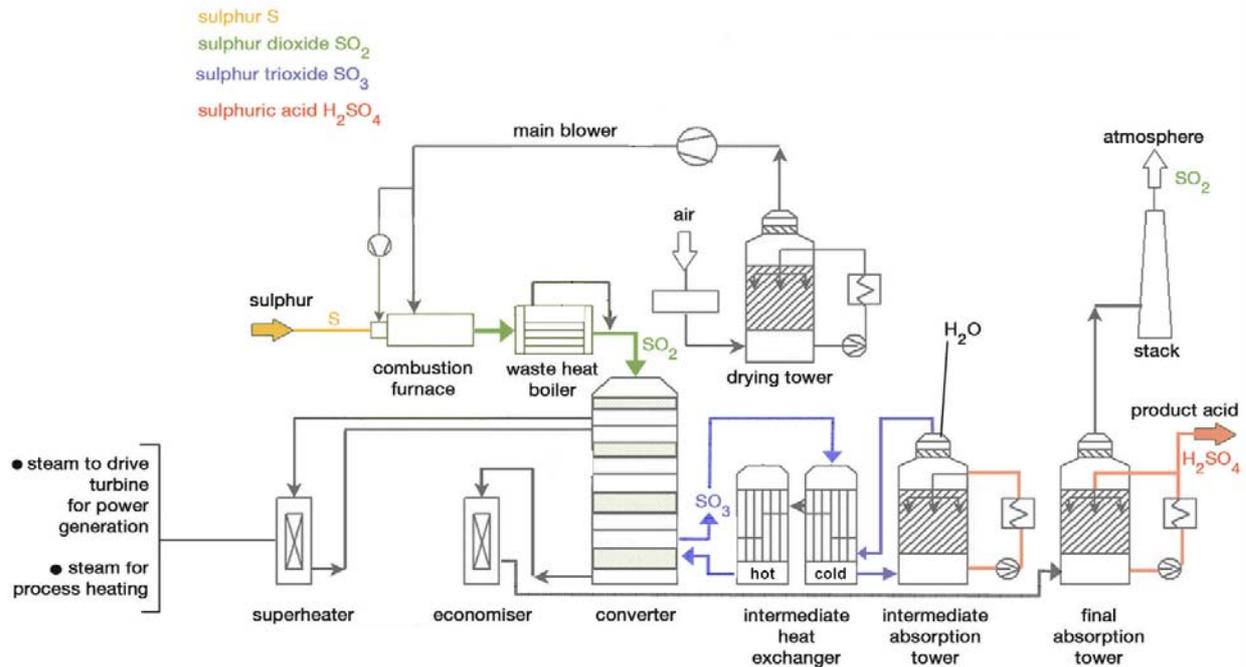
The following items comprise this project component:

- A sulphur burning acid plant to be built at the Rössing mine site;
- The onsite acid storage facilities will be upgraded and utilised to store acid imported and produced;
- The importation of acid through Walvis Bay harbour will continue but at a reduced rate, and the acid offloading and rail loading facilities as well as the tank farm at the harbour will be maintained and transport of acid by rail to the Rössing mine site will continue as required;
- Rail transport by Transnamib through Walvis Bay and Swakopmund will continue;
- The acid offloading facilities at Rössing mine will be upgraded;
- The waste heat from the new acid plant will be converted to produce electricity to be fed into the local grid or utilised on site in the leaching process;
- A preliminary site selection exercise has been conducted and the new plant will be positioned near the existing offloading and storage facilities; and
- Elemental sulphur is planned for importation by ship to Walvis Bay harbour and for transportation by rail to the Rössing mine site. A bulk sulphur storage and handling facility will be built at Walvis Bay Harbour as well as at Rössing mine. There will be a need for specialised rail cars for the transport of sulphur.

## 2.2.2 The proposed sulphuric acid production process at RUL

Figure 5 provides a diagrammatic illustration of the sulphuric acid plant proposed for RUL. Operational specifics of this plant are provided later in this section. In essence, the sulphuric acid that is proposed for production at RUL will be converted from elemental sulphur feedstock shipped to Walvis Bay harbour. Grindrod Limited, the lessee from Namport and operator of the

bulk handling terminal in the Port of Walvis Bay will undertake the activities related to offloading and storing of the sulphur. Similarly, Namport will be the agent responsible for the control of the vessels entering the harbour and their berthing. Appropriate environmental responsibilities vest with this agent with respect to harbour and berthing related matters. RUL is committed to ensuring that its activities, as well as those of its suppliers and other parties that form part of the chain of custody, conduct their business activities in an environmentally responsible manner. To this end, technical and environmental information arising from the present SEIA will be shared with these parties.



**Figure 5: Diagrammatic illustration of the proposed sulphuric acid plant and related chemical flows** (source: Modified from RUL Public Participation Material, 2007)

The double contact, double absorption process is proposed for RUL and is generally favoured as the most stable and with the highest (most efficient) yields of product. This correlates well with a preferred environmental option as this efficient (and more stable) combustion is associated with more manageable, predictable and measurable atmospheric outputs – the principle environmental concern associated with acid plants. This is described below, beginning with a generic description of the contact process and then considering the specifics of the double contact acid production process.

The contact process involves the catalytic oxidation of sulphur dioxide, SO<sub>2</sub>, to sulphur trioxide, SO<sub>3</sub>. The main chemical steps are summarised in the box to follow.

Before combustion, sulphur must be melted by heating to 135°C. Combustion is carried out in sulphur combustion units at between 900°C and 1800°C. The combustion unit consists of a combustion chamber followed by a process gas cooler. The SO<sub>2</sub> content of the combustion gases is generally around 18% by volume and the O<sub>2</sub> content is low (but higher than 3%). The key steps that follow combustion are #2 to #6 in the following box.

1. Solid sulphur, S(s), is burned in air to form sulphur dioxide gas, SO<sub>2</sub>  

$$\text{S(s)} + \text{O}_2(\text{g}) \rightarrow \text{SO}_2(\text{g})$$
2. The gases are mixed with more air then cleaned by electrostatic precipitation to remove any particulate matter
3. The mixture of sulfur dioxide and air is heated to 450°C and subjected to a pressure of 101.3 - 202.6 kPa (1 - 2 atmospheres) in the presence of a vanadium catalyst (vanadium (V) oxide) to produce sulphur trioxide, SO<sub>3</sub>(g), with a yield of 98 %  

$$2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$$
4. Any unreacted gases from the above reaction are recycled back into the above reaction
5. Sulphur trioxide, SO<sub>3</sub>(g) is dissolved in 98 % (18M) sulphuric acid, H<sub>2</sub>SO<sub>4</sub>, to produce disulphuric acid or pyrosulfuric acid, also known as fuming sulphuric acid , H<sub>2</sub>S<sub>2</sub>O<sub>7</sub>.  

$$\text{SO}_3(\text{g}) + \text{H}_2\text{SO}_4 \rightarrow \text{H}_2\text{S}_2\text{O}_7$$

This is done because when water is added directly to sulphur trioxide to produce sulfuric acid

$$\text{SO}_3(\text{g}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_2\text{SO}_4(\text{l})$$

the reaction is slow and tends to form a mist in which the particles refuse to coalesce
6. Water is added to the disulfuric acid, H<sub>2</sub>S<sub>2</sub>O<sub>7</sub>, to produce sulphuric acid, H<sub>2</sub>SO<sub>4</sub>  

$$\text{H}_2\text{S}_2\text{O}_7(\text{l}) + \text{H}_2\text{O}(\text{l}) \rightarrow 2\text{H}_2\text{SO}_4(\text{l})$$

A primary conversion efficiency of 80%-93% is obtained in the double contact process, depending on the arrangement of the contact beds and the contact time in the primary contact stage of a converter preceding the intermediate absorber. The gases are cooled to approximately 190°C in a heat exchanger and the SO<sub>3</sub> already formed is absorbed in sulphuric acid with a concentration of 98.5-99.5%wt in the intermediate absorber.

The absorption of SO<sub>3</sub> produces a considerable shift in the reaction equilibrium towards the formation of SO<sub>3</sub>, resulting in considerably higher overall conversion efficiencies when the residual gas is passed through one or two secondary contact beds. The SO<sub>3</sub> formed in the secondary stage is absorbed in the final absorber.

Feed gases containing 9-12% of SO<sub>2</sub> are generally used for this process. The conversion efficiency is about 99.6% as a daily average, based on sulphur burning.

The sulphuric acid that will be used in the process will be produced on site by burning sulphur in a double contact, double absorption acid plant. This plant will be constructed using best international practice and will contain the required concrete bunding and sealed barriers to prevent any spill movement. The acid plant will produce 1 200 tpd sulphuric acid at approximately 98.5% efficiency rate. The SO<sub>2</sub> to SO<sub>3</sub> conversion efficiency is likely to be in the order of 99.7%.

The elemental sulphur will be in the form of “prills” (pellets) delivered to the site via rail and stored in an enclosed storage area containing the requisite fire detection and control equipment. This area of responsibility will form part of RUL’s ongoing operational occupational health and safety protocols and procedures. It is anticipated that the plant will be shut down initially after 18 months and thereafter every 24 months. However, weekly maintenance events of eight hours will be carried out.

The SO<sub>2</sub> will be cooled before passing to the sulphur converter, where SO<sub>2</sub> will be converted to SO<sub>3</sub> using four passes of vanadium pentoxide (V<sub>2</sub>O<sub>5</sub>) catalyst to ensure complete conversion to SO<sub>3</sub>. After the last pass, the gas will be cooled before entering the final absorption tower, where

the SO<sub>3</sub> will be absorbed in a counter-current flow of 98.5% sulphuric acid. The depleted gases will then be vented to the atmosphere via a stack of as yet to be determined height.

The sulphuric acid will be stored in the two existing storage tanks ready for use in the plant.

At this stage in the design formulation, air cooling fans, probably comprising eight units, are the preferred option for cooling.

The main inputs and outputs can be summarised as follows:

- **Inputs**

- sulphur prills imported to site from Walvis Bay;
- water (from Namwater);
- steam derived from the sulphur burner; and
- V<sub>2</sub>O<sub>5</sub> (consumed at approximately 15% of installed catalyst volume per year).

- **Outputs**

- SO<sub>2</sub> from the drier at approximately less than 250 ppm/Nm<sup>3</sup>;
- <30 mg of acid mist and SO<sub>3</sub> per Nm<sup>3</sup>;
- cooling water recycled back to the cooling tower;
- cooling tower and boiler blow down will be disposed of in the Plant Spillage Sump (<30 m<sup>3</sup>/h);
- sulphuric acid to be (re)used in the plant;
- sulphur filter cake of approximately <3 000 kg/d to be recycled in the acid plant; and
- spent V<sub>2</sub>O<sub>5</sub> catalyst returned to the suppliers.

### 2.2.3 Sulphur handling and storage facilities in the Port of Walvis Bay

Sulphur storage facilities will be constructed at Walvis Bay harbour. The location within the harbour complex has been indicated by Namport as the area landwards of the Grindrod Limited bulk handling facility and the storage housing will be enclosed. Dry sulphur will be stockpiled in this storage area in preparation for railing to the mine. The construction and operation of additional sulphur receiving and storage facilities will be undertaken by Grindrod Limited.

Elemental sulphur (the form to be stored at the harbour and used as feedstock for the acid plant) is environmentally benign in the context of its planned storage. Provided the necessary protocols around the inhalation and handling of sulphur dust (and the sulphur pellets themselves) are observed, in addition to its secure containment *in situ*, this issue is not deemed significant enough to warrant further in-depth consideration. Special attention should, however, be paid to the minimisation of sulphur dust and the concurrent risk of sulphur explosions.

The following key construction and operational descriptive issues will be carried through to the SEIA stage:

- Clarity on the design parameters of the storage facility;
- The exact nature of bunding and sealing systems as part of the storage facilities;

- Drainage (storm water) management in and around the site;
- Internal ventilation system specifics;
- Maximum volume storage and handling quantities;
- Specific detail on the transport pathways from the storage areas to the rail cars; and
- Specific detail from the contractor on how sulphur (stored product) friability will be minimised with a view to minimising the chances of sulphur dust explosions.

#### 2.2.4 Primary product rail transportation and intermediate and final storage

Sulphur will be transported from Walvis Bay to the mine site in railcars made from mild steel. There is an existing railway line between Walvis Bay and the mine which is well used in terms of currently transporting sulphuric acid to the mine. The anticipation and management of impacts and operational protocol along this route is well established. The transportation of elemental sulphur to the mine will be outsourced to Transnamib.

With respect to rail transportation, the following key elements will be considered and carried through to an EIA (in terms of specific operational descriptions)<sup>8</sup>:

- The specific design parameters of the rail cars that will be used to transport sulphur to the mine;
- The potential for modification and use of existing rails cars to accommodate elemental sulphur as required;
- Linked to the above, mechanisms to ensure complete discharge of sulphur from the rail cars to the unloading point at RUL;
- Requirements for sealing the rail cars;
- Any modification to operational responses to spills;
- Good approximations of volumes to be transported; and
- The use of wash bays at Walvis Bay insofar the requirements and considerations of elemental sulphur handling are concerned.

With respect to the storage and handling of product within the acid plant, there is negligible concern related to the storage and handling of manufactured sulphuric acid on the RUL site because of the very low vapour pressure of H<sub>2</sub>SO<sub>4</sub> in normal temperature conditions and the sealed containers which will be used for storage. This forms part of RUL's ongoing and well-understood operational activities on site.

The receipt, handling and storage of any powdered raw materials will be carried out so as to minimise the emission of dust. Liquid and gaseous feeds within the plant will also be carefully contained to prevent the emission of odorous fumes or gases.

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<sup>8</sup> This has been determined principally from scoping level discussions with Mr J Dempsey of Transnamib, reviews of existing EIAs and EMPs relevant to rail transportation, specialist opinion and a consideration of existing and best practice.

Sulphur storage and handling operations on site will be designed with a specific view to control fume emissions. Venting will be directed towards (existing) acid tanks or scrubbing systems and all installations will be built by following best engineering practice. Special consideration will be given to areas where emissions can condense and solidify in cool areas. This is fortunately of low potential in RUL's desert environment but nonetheless will be carefully guarded against to prevent over-pressurisation of storage tanks.

## 2.2.5 Environmental emissions

Environmental emissions of principle concern anticipated from the proposed plant are atmospheric. This specific environmental aspect (see later discussion) is deemed the most important to consider during the SEIA stage.

Other less substantive emissions and environmental outputs are discussed elsewhere in this report. With respect to addressing this issue in the SEIA stage of the study, the following are some key questions (from a process and plant description point of view) that will be specifically posited and answered in the SEIA report:

- What are the optimum design parameters for the new plant given the location preference?
- How close will real environmental outputs be to modelled outputs?
- What are the environmental impacts of stack height options?
- How will start up conditions and emissions be controlled and mitigated, specifically with respect to sensitive receptor points such as the Swakopmund – Usakos road and Arandis town?
- What are the pertinent operational emission parameters to consider with respect to RUL personnel on site?

Point and non-point sources of RUL's gaseous emissions are reflected in Table 1 below.

Source		SO <sub>2</sub>	SO <sub>3</sub>	NO <sub>x</sub>	NH <sub>3</sub>	CO	CO <sub>2</sub>	Acid vapour	Odour
<b>Pit area</b>	Open pit				NP	NP	NP		
	Blasting			P	P				
<b>Uranium extraction plant</b>	FPR baghouse x1	P		P	P	P	P		
	FPR scrubber x2	P		P	P	P	P		
	FPR cooling towers x2								
	Leach tanks						P		
<b>Acid plant</b>	Absorption tower	P	P					P	P
	Plant	NP		P					
<b>Waste</b>	Domestic waste								P
<b>Other</b>	Rubber lining w/shop			P		P	P		
	Rubber burning			P		P	P		P

### Definitions:

FPR = Final product recovery

P = point source

NP = non-point source

**Table 1: Broad overview of the gas source inventory at RUL**

## 2.2.6 Hazard implications of sulphur

Sulphur is a flammable substance in both the solid and liquid states. The dust is characterised by a very low ignition point of 190°C compared to other combustible dusts, and dust clouds are readily ignited by weak frictional sparks. Dusts containing 25% or more elemental sulphur may be almost as explosive as pure sulphur.

Explosive mixtures may be formed if sulphur is contaminated with chlorates, nitrates or other oxidising agents

Sulphur has excellent electrical insulation properties and under the right conditions will readily pick up static electricity which, if discharged, can result in ignition.

## 2.2.7 Personnel

It is envisaged that between 150 and 200 workers would be required to undertake the construction and commissioning of the acid plant. This number would drop significantly to between 30 and 40 staff members during the operation of the plant.

## 2.3 RADIOMETRIC ORE SORTER PLANT

### 2.3.1 Context – as provided in the Scope of Work

RUL has operated for over 30 years with a conventional crushing and milling circuit. The coarse ore from primary crushing is screened and crushed in three additional crushing stages prior to milling in rod mills and subsequently acid leaching.

RUL has a long history of involvement with radiometric sorting dating back to exploration test-work in 1968 and the mine currently uses truck scanners for final grade control. Studies during the 1970s concluded that radiometric sorting in the plant would only make economic sense by increasing production levels but until recently the uranium market has not been conducive to this. In the mid 1990s however, newer, more efficient sorter technology made sorting viable at constant rates of production and in 1998 RUL approved the construction of a single-sorter pilot plant.

During 2001 the pilot plant was commissioned and test-work began and ran until 2003. Due to poor market conditions and the prospect of closure during 2003/04, the ore-sorter was not operational but started up again in 2005. In mid 2005 approval was granted to tie ore sorting into the fine crushing plant as a production plant and capital was spent on the installation of a waste conveyor. During the period May to December 2006 a total of about 60 000 tonnes of ore was fed to the crusher of which a sizeable portion was rejected to waste which confirmed that ore-sorting at RUL is technically feasible.

An environmental impact assessment for a production scale ore sorting plant at Rössing was completed in March 2002. The study concluded that the occupational hazards associated with the potential production ore sorter would be very similar to those already identified for the fine crushing and pilot ore sorting plants. Occupational hazards on the production plant itself were found likely to be low as a result of minimal operator presence on the plant, especially under load. However, the production ore sorter's contribution within the whole fine crushing area would likely be more significant.

It was predicted that, as a result of ore sorting, high silica content rock types in feed ore would reduce. With a production ore-sorting plant in place, the average grade through the process would increase. A marginal increase of the annual average radiation dose attributed to dust was expected. However, the total radiation dose to employees in the processing plant was expected to remain well below the RUL standard based on International Council for Radiological Protection (ICRP) recommendations.

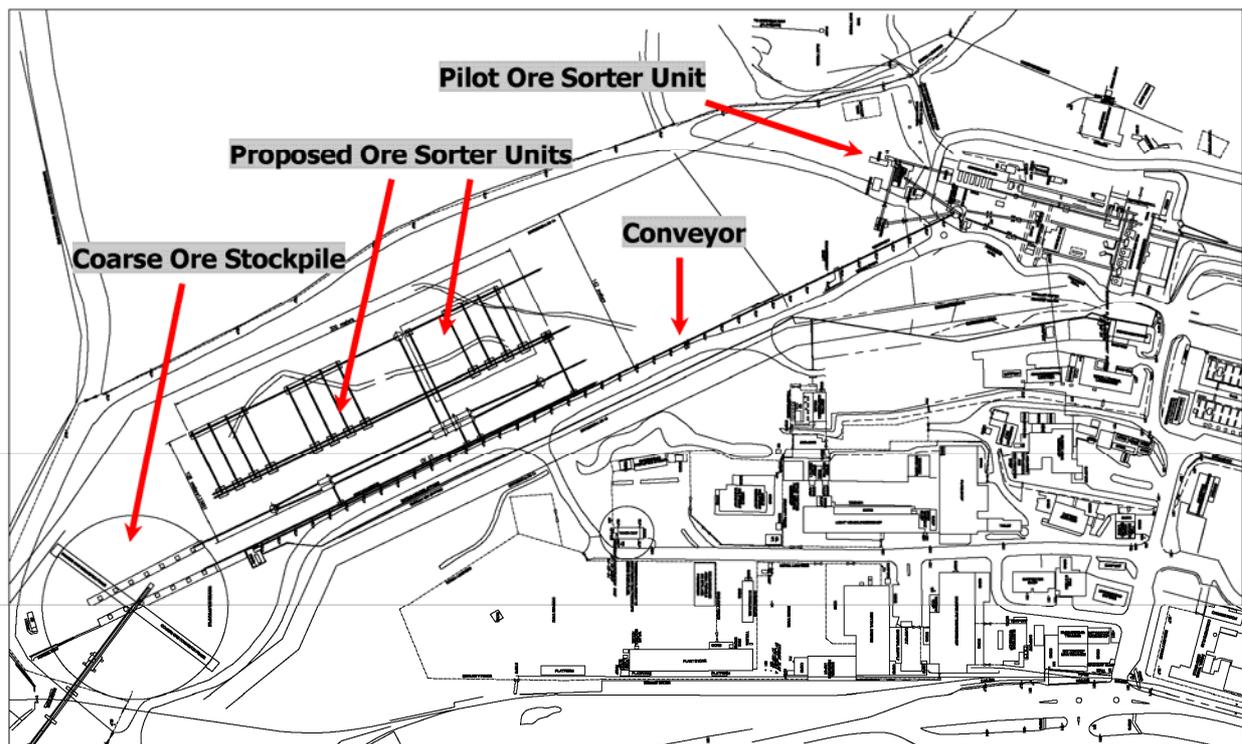
The ore sorting production plant was predicted to be a source of noise. However, the largest environmental impact associated with construction and operation of the ore sorter production plant would be the deposition of the reject material. In the original work, the possible sites with the least potential impact on the environment were identified as the top of the tailings dam or a site between the southern toe of the tailings dam and the fine crushing plant.

The conclusions in respect of a suitable dumping site were reviewed by in-house consultants in 2005. Considering the low waste volume which was related to the production plans prior to mine life extension, two further disposal sites were identified.

Since the extension to the life of mine and the intention to increase production capacity has been approved, the radiometric ore sorting plant is again seen as an important contributor to achieving the desired increase in throughput and uranium production.

A new pre-screening plant, replacing the existing one, drawing material from the coarse ore stockpile, will be constructed as part of the project to provide the material for sorting.

Specific size fractions will be scalped off in the pre screening plant and the remaining size fraction will be processed using the radiometric ore sorters to provide an “accept” stream and a “reject” stream. The accept stream contains ore above the selected uranium grade and conversely the reject stream contains waste. The existing 500 t coarse ore bin will be reconfigured (or replaced) to increase its live capacity and to feed the secondary crushers. The proposed plant is to be positioned within the current operations of the Rössing mine on the west side of the reclaim conveyor from the coarse ore stockpile. See Figure 6. Geotechnical data will confirm this as a suitable location from a stability perspective.



**Figure 6: Location and layout of proposed ore sorter units** (source Bateman Africa)

The engineering work for the project would entail construction of systems for ore reclaiming from the coarse ore stockpile, the pre screening plant, the production ore sorting plant, waste handling, and rejection of material to the nominated waste storage area and tie-in for all equipment into the current operation. It would include provision of various facilities, including maintenance, warehouse, control room, compressed air, on site utility distribution (water, electricity etc) and identification of lay down areas required for construction.

Findings of previous environmental assessments have indicated that there will be no major adverse impacts from the construction and operation of a radiometric ore sorter plant. The radiological hazard is expected to be well below the ICRP recommended limits. Noise levels and airborne dust emissions are expected to be maintained below the maximum permissible exposure levels for the area. However the area will be demarcated as requiring personal hearing and breathing protection as a safe guard for personnel.

### 2.3.2 Construction and process specifics

#### a) The present system of ore sorting

This section provides some detail on the operational elements of the ore sorting circuit.

- **Pre-screening plant:** Due to the presence of a significant amount of fine size material in the plant feed, a pre-screening section was added to the fine crushing plant in 1998. The purpose of this pre-screening plant is to screen and divert fine material away from the crushing circuit and to discharge this material directly to the fine ore stockpile for processing.
- **Fine crushing plant:** Coarse ore is withdrawn from the coarse ore stockpile by vibrating pan feeders, feeding onto a coarse ore reclaim conveyor. This conveyor discharges to a 1000 t surge bin ahead of the secondary crushers. The ore is further processed through secondary, tertiary and quaternary stages of crushing and screening and then delivered via a conveyor belt to the fine ore stockpile.

There are typically three levels of grade control presently applied at the Rössing mine, as follows:

- Analyses of blast hole data, whereby each blast is separated into a series of composites of similar characteristics, essentially based on a combination of ore grade and calc. index.
- The second level of control is derived from the scheduling process whereby mine planning ensures a balanced feed (of ore grade and calc. index) to the plant from the available blast composites.
- Radiometric truck scanners assess the average grade of a truckload of material to determine whether the load should be designated as ore, low grade ore or waste.

Implicit weaknesses in the above grade control process include the following:

- There are inherent limitations to which the geology and mine planning staff can identify ore grade and calc. index in a 15 m bench which has been blasted and which has therefore undergone internal mixing and significant lateral movement.
- The estimation of rock type is assessed on a visual basis for the composite as a whole, substantially on the basis of an inspection of the surface of the blasted muck pile. There are no sample values or scanner checks to improve accuracy.
- The truck scanner only scans about 5% of the crusher feed, being the surface 30 cm of each truck load.

### b) The proposed system of radiometric ore sorting

The concept for production radiometric ore sorting is to install between eight and ten sorter units after the pre-screening plant and ahead of the fine crushing plant. The ore sorters will remove individual rocks below a set  $U_3O_8$  grade from the feed stream using radiometric detection and compressed air ejection, resulting in a high-grade stream and a waste stream. The high-grade stream will be returned to the pre-screening plant coarse ore stream via conveyor, and the waste stream will be conveyed from the ore sorting machine to a yet to be determined waste rock disposal site.

Ore will be fed onto the ore-sorting machine via vibrating feeders and vibrating screens. An existing pilot plant is present on site. Note that the production sorting plant will be located some distance to the southwest of the pilot plant and that the pilot plant unit will be incorporated into the new production sorting plant. The machine's design combines a mechanical feed with a rock radiation measuring device and an optical rock profiling system. The rocks will be sorted on an "accept" and "reject" basis dependent upon the radiation content. The accept rock will be loaded onto the Accept Conveyor CV-11 and the reject rock onto the Reject Conveyor CV-12. Compressors will be installed to provide compressed air for the air blast chambers of the ore-sorting machine. In addition, a dust extraction system will be installed to control dust at all transfer points as well as the ore sorting machine and blast chamber.

The ore sorting production plant would be interfaced with the site process control and be operated remotely resulting in low labour requirements.

### c) Environmental and economical advantages of the ore sorting plant

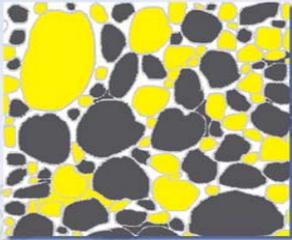
The following summarises the economic and environmental advantages of an ore sorting plant versus more conventional methods of increasing processing volume:

- An ore sorting process is a logical extension to the truck scanning process, allowing for an increased proportion of mill feed to be scanned. This has obvious advantages in terms of reducing infrastructure and the volume of vehicular traffic on the mine. This has known positive effects in terms of *inter alia* reduced dust and exhaust emissions.
- High grade ore with a high calc. index, low grade ore and even waste ore may become economical to process with the installation of an ore sorting plant. This would result in major cost benefits during clean-up operations upon decommissioning. Effected savings could be focused on rehabilitation.
- Although sorting may not reduce the acid consumption per tonne of ore leached, acid used per unit of  $U_3O_8$  produced will be reduced as less tonnes of ore will need to be leached. This has directly beneficial impacts in terms of tailings produced and acid volumes utilised.
- Sorting does show a major cost benefit in the form of savings from variable costs as a result of less tonnes of ore being processed. Such savings also result from a reduction in the use of both fresh water and power consumption. Given the volume of water use and RUL's location in an arid environment, as well as the operation's draw on the power grid, these reductions would be welcome from a sustainability perspective.

Figure 7 summarises the key advantages of the proposed process.

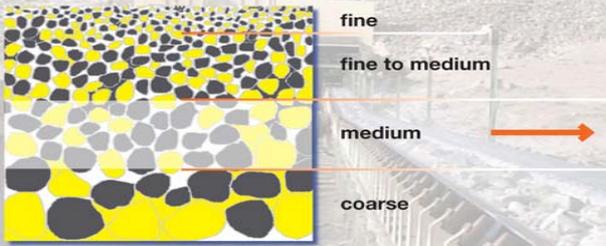
# Ore Sorting

**Currently, an ore / waste mix of rocks of different sizes are all conveyed through to the production process.**




**In the existing Ore Sorting Pilot Plant, the material is scanned for radioactivity. Only radioactive material is accepted. Waste rock is ejected for disposal.**

**The Pilot Plant currently processes a percentage of medium sized material.**



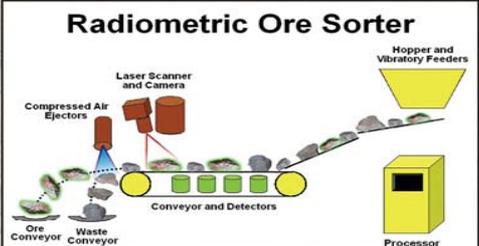

**Advantages:**

- ⊕ Cost effective
- ⊕ Increased production levels
- ⊕ More feed material
- ⊕ Reduced usage of consumables

**Timeline:**

- ⊕ Feasibility Study completed - end 2007
- ⊕ Identify future potential site
- ⊕ Identify disposal site
- ⊕ Decision to be taken by March 2008

**Radiometric Ore Sorter**





**Rössing Uranium**  
A member of the Rio Tinto Group  
WORKING FOR NAMIBIA



Figure 7: Sustainability advantages of extending the radiometric ore sorter plant (source; RUL public participation information)

### 2.3.3 Personnel

Projections of personnel requirements into the future indicate that approximately 50 additional staff members would be required for the operation of the ore sorter plant. Figures for the number of workers required to undertake the construction and commissioning of the ore sorter plant will become available as the engineering design reaches completion.

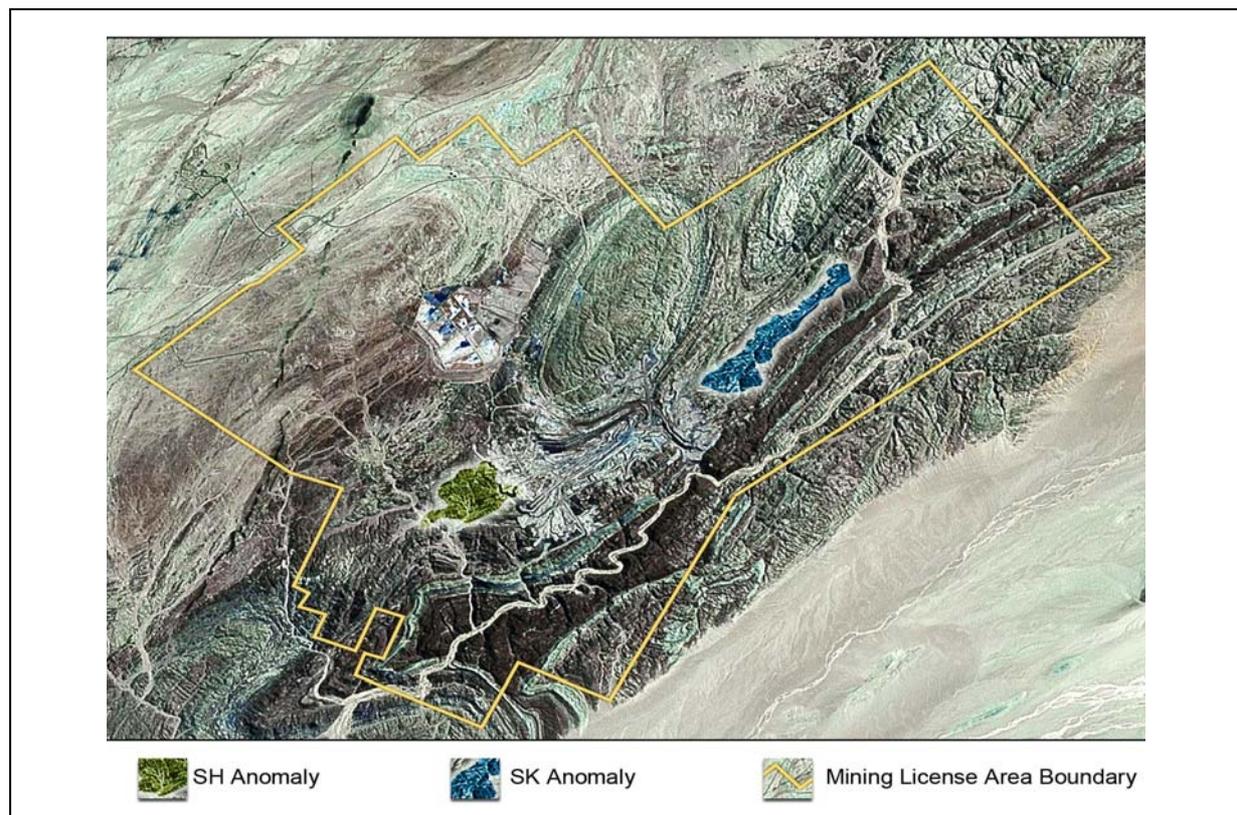
## 2.4 OPEN PIT IN AREA SK4

This section is compiled from a synthesis of the following reference material:

- Draft Environmental Management Plan: Extension of Mining Activities into SK4. Rössing Uranium Limited. 2007 (unpublished).
- Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2004.
- 2006 Report to Stakeholders ~ Social, Economic, Environmental. Rössing Uranium/Rio Tinto. 2007.

### 2.4.1 Context

During earlier geological exploration undertaken in RUL's mining license area, two other areas of potentially viable ore besides the active SJ pit were identified. These are referred to as the SH and SK anomalies<sup>9</sup> and are located within three kilometers to the west and northwest of the SJ pit respectively. See Figure 8.



**Figure 8: Location of SH and SK anomalies** (source RUL)

<sup>9</sup> Both the SH and SK anomalies are proposed for eventual mining and an SEIA to seek environmental approval for their exploitation will follow as Phase 2 of RUL's expansion project. See Section 2.1 above in this regard.

The SK anomaly is of particular importance since it contains a smaller area of ore grades that are significantly higher than the active SJ pit. Besides the economic motivation presented by the increase in uranium prices on the international market in recent years, exploitation of this area within the SK anomaly, known as SK4, would supplement the lower grade ore currently processed by RUL.

Since the exploitation of SK4 may be seen as an augmentation rather than an expansion of existing operations, RUL initially adopted the approach that an amendment to the EMP already in place would satisfy the social and environmental obligations necessitated by mining SK4. Although this approach was acceptable to the responsible authorities, and a draft EMP for the extension of mining activities into the SK4 area was prepared (Rössing Uranium Limited, 2007), RUL has subsequently decided to subject the proposed development to comprehensive environmental assessment. This was motivated by their recognition that certain biological elements in the SK area are not well understood to allow for environmental decision-making, viz. the conservation status of the invertebrate fauna extant in the area. Adopting this approach is in accordance with RUL's adherence to the precautionary principle in environmental management.

As a consequence of RUL's adopting the precautionary principle, the proposed mining of the SK4 ore body is being subjected to comprehensive environmental assessment by being included as one of the components of the present SEIA for Phase 1 of the expansion project.

#### **2.4.2 Method and extent of mining**

The pioneering work required to allow access to the SK4 site would comprise drilling, some minor blasting and the use of heavy earth moving plant. Once suitable road access has been created, excavation will be undertaken to provide a drilling platform.

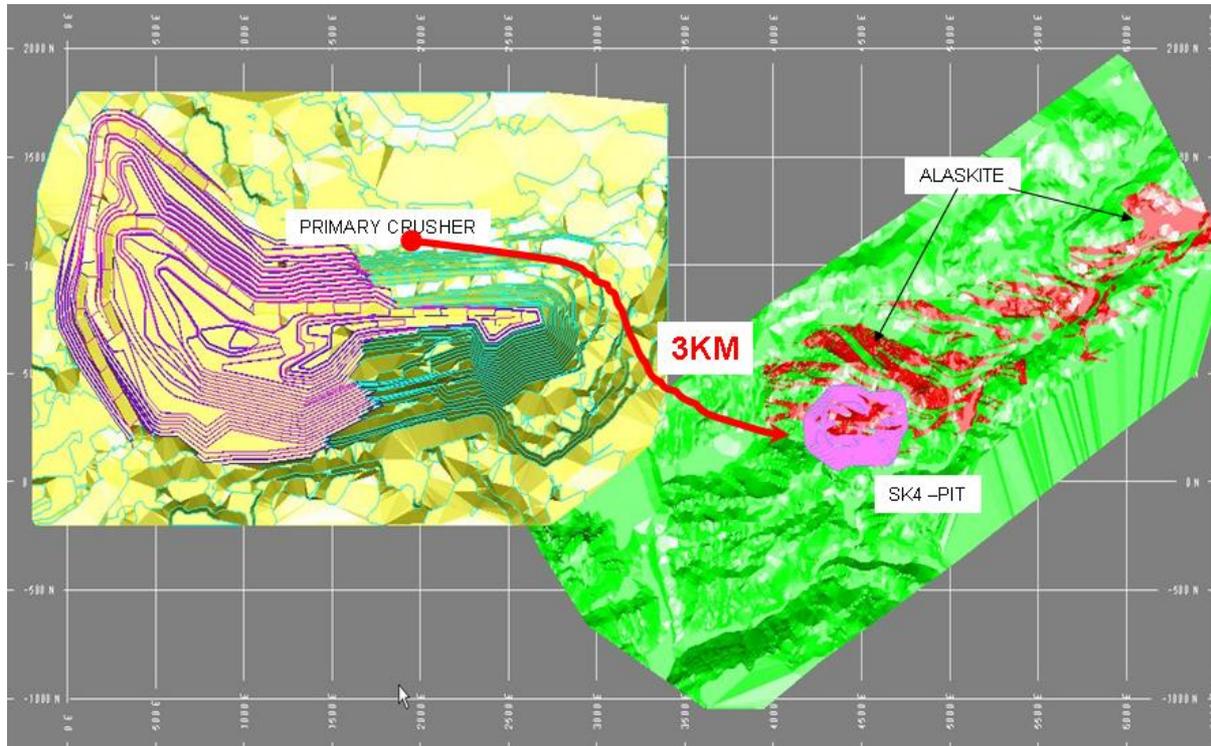
The drilling platform will then allow the initial excavation of two 15 m deep benches and access by loading equipment. The typical open-cast mining sequence of drilling, blasting, loading and haulage will be applied. Various heavy equipment will be put to use on the site, including an excavator and dump trucks, supported by a bulldozer and front-end loader. A water cart for dust suppression and a diesel bowser for refuelling will also be available.

It is envisaged that the SK4 pit will eventually comprise about 10 benches, in an excavation of 600 m in length, 300 m in width and 150 m in depth. The life of the SK4 ore body mine is anticipated to be approximately three years.

#### **2.4.3 Haulage, processing and waste**

A single haulage road of some 35 m in width is envisaged, accessing the SK4 pit in the northwest corner. This dedicated haulage road will continue to the existing primary crusher which is situated 3,5 kms to the northwest of the SK4 pit. Figure 9 provides a nominal indication of the route of the haul road and it should be noted that the infilling of a drainage line will be necessary to accommodate the road alignment. Although this infilling will result in an intrusion

into the landscape, its low elevation and the already transformed nature of the surrounding biophysical environment will be such that the impact of this section of the haul road will not be significant. The material from the SK4 pit will then continue in the ore stream, to be processed in the normal fashion through the existing metallurgical plant.



**Figure 9: Nominal alignment of the SK4 haul road** (source: RUL)

The waste rock ( $\pm 20$  Mt) derived from the SK4 pit will be accommodated within existing waste dump sites and an area designated as *Waste 7* has been earmarked for this purpose. Although this waste dump site offers sufficient capacity to hold the waste ore from the SK4 pit, the longer term implications of visual intrusion on elevated horizontal lines in the landscape will be considered.

#### 2.4.4 Infrastructure

Water will be required for drilling activities and dust suppression in the SK4 pit. The current rate of water usage for these purposes for the entire mine operation is  $\pm 700$  m<sup>3</sup>/day. This figure is likely to double with the exploitation of the SK4 ore body and expansion of the mining activities in the active SJ pit.

Groundwater is presently abstracted from the Khan River for use in dust suppression and this source provides in the order of 600 m<sup>3</sup>/day. A waste transfer pond in the waste rock disposal area designated *Waste 4* will provide the necessary water for SK4. This pond is fed by water from the Khan River source and it is intended to increase its volume by supplementation from plant runoff from Boulder Gorge and treated effluent from the waste water treatment works. The

supply of water to the SK4 pit is thus an integrated element of the management of water for the entire mining, processing and waste disposal operation<sup>10</sup>.

Together with water being provided for the SK4 mining activity, electricity will also be brought to the site. The principle of optimising linear infrastructure within existing or planned utility corridors will be applied, meaning that the dedicated haulage road would in all likelihood also provide the route for electricity and water supply.

#### 2.4.5 Personnel

The development and exploitation of the SK4 ore body would require a workforce of 190 personnel. Most of these would be employed in the drilling and blasting activities, and in the loading and hauling operations.

If the present mining contractor undertakes the development and exploitation of SK4, 150 personnel would be relocated from their present deployment in the SJ pit to the SK4 site. Consequently, 40 additional personnel would need to be employed. However, if RUL decides to undertake the mining themselves, the required personnel would be sourced from within the organisation or permanent skilled personnel would be employed.

It should be noted that the present personnel complement in the active SJ pit is in the order of 200 people. The additional requirement for the SK4 pit is therefore a relatively substantial proportion of the mining workforce. This is explained by the fact that the mining activities at the SK4 site will be accomplished by means of smaller plant and equipment, which require more operators to reach the same levels of output.

When compared to the entire RUL workforce of  $\pm$  1100 permanent employees<sup>11</sup>, however, the increment in personnel numbers that would result from the proposed development and exploitation of the SK4 ore body is not substantial.

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<sup>10</sup> With reference to groundwater quality, the intention is to include the SK area in the existing groundwater flow model that is applied by RUL (Aquaterra, 2005). This will require an extension of the application, insofar the physical area that is covered by the model is concerned.

<sup>11</sup> 939 in 2006 (Rössing Uranium Limited, 2007), although this figure doubles when contract and temporary employees are included.

### 3 PUBLIC PARTICIPATION PROCESS

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#### 3.1 INTRODUCTION AND SYNOPSIS OF ISSUES

Engagement with the public and stakeholders interested in or affected by development proposals forms an integral component of the environmental assessment process. Thus, I&APs will have an opportunity at various stages throughout the SEIA process to gain more knowledge about the proposed project, to provide input and to voice any issues of concern.

Stakeholders and I&APs have had several opportunities to participate in the Scoping stage of the present SEIA process and the useful inputs received are acknowledged. The following are the most noteworthy of the issues raised by I&APs to date, as derived from the stakeholder feedback forms provided in Annexure H of this report:

- Employment opportunities;
- Workplace health and safety concerns, including air and water pollution and noise;
- Housing implications;
- Services such as schools, medical care and water availability;
- Effects on the regional and local economy, including tourism;
- Negative social impacts from newcomers seeking work;
- Possible human and environmental threats from transporting, storing and processing sulphur and sulphuric acid, in and between Walvis Bay and the mine site;
- Possible dust and noise threats to humans and the environment from the ore sorter plant and from the SK4 mining area, including waste rock management;
- Biodiversity implications, particularly in the SK4 mining area;
- Supply, storage, application, runoff and reuse of water, particularly in the SK4 mining area;
- Regional implications of bulk water supply;
- Visual impacts of the acid plant, ore sorter or SK4 mining activities; and
- Energy use.

The objectives of public participation will be maintained throughout this SEIA process. These are to provide information to the public, identify key issues and concerns at an early stage, respond to the issues and concerns raised, provide a review opportunity, and document the process properly,

#### 3.2 IDENTIFICATION OF STAKEHOLDERS

The following stakeholder groups were identified as the key ones to be consulted during the assessment process:

- Central government ~ Ministries of:
  - Mines and Energy

- Health and Social Services
- Labour and Social Welfare
- Environment and Tourism
- Agriculture, Water and Regional Development
- Regional and Local Government and Housing
- Education
- Regional and local government:
  - Erongo Regional Council
  - Swakopmund Town Council
  - Walvis Bay Town Council
  - Arandis Town Council
- The !Oe#Gan Traditional Authority,
- other uranium mines in the Erongo Region,
- Rössing Uranium Limited,
- The Rössing Foundation,
- the media,
- Namport,
- Namwater,
- Nampower,
- Transnamib,
- farmers, both small-scale and commercial,
- other economic sectors which may be affected by mineral exploitation, e.g. tourism,
- community groups and social institutions in Swakopmund, Walvis Bay and Arandis,
- service providers, and
- organised labour.

### 3.3 INITIATING THE PROCESS (SCOPING STAGE)

The proposed project was advertised in national, regional and local newspapers, as reflected in Table 2 below. Annexure C provides an example of one of these advertisements. The advertisements also announced the commencement of the SEIA process, provided information about the public participation meetings and invited registration as I&APs. The aim was to raise wide public awareness of the project.

Newspaper	No of placements	Placement Dates	Page	Heading
Namib Times	2	14,17 August 2007	3	Public Meetings
Republikein	2	15,17 August 2007	3	Public Meetings
Republikein	1	20 August 2007	3	Public Meetings
Namibian	2	15,20 August 2007	5	Public Meetings
Namibian	1	17 August 2007	5	Public Meetings
All.Zeitung	2	15,17 August 2007	3	Public Meetings
All.Zeitung	1	20 August 2007	3	Public Meetings
New Era	2	15,17 August 2007	5	Public Meetings
New Era	1	20 August 2007	5	Public Meetings
Economist	1	17 August 2007	5	Public Meetings
Informante	1	16 August 2007	5	Public Meetings
Southern Times	1	18 August 2007	3	Public Meetings
Observer	1	18 August 2007	3	Public Meetings
Plus Weekly	1	17 August 2007		Public Meetings

**Table 2: Schedule of newspaper advertisements**

Notices of the public participations meetings were posted in public places in Swakopmund, Walvis Bay and Arandis. Annexure D provides an example of one of these notices.

A Public Information Document (PID) was forwarded to I&APs, made available at the public participation meetings and was provided on request. Annexure E provides a copy of the PID. This PID aimed to inform I&APs about the proposed development by RUL and to promote participation by stakeholders in the SEIA process.

A comment sheet was provided at the public participation meetings, inviting comments on issues that stakeholders saw as critical for inclusion in the SEIA.

Three public participation meetings were held during the initiation of the SEIA process, as follows:

- Alte Brücke, Swakopmund : 20 August 2007
- Pelican Bay Hotel, Walvis Bay : 21 August 2007
- Arandis Town Hall, Arandis : 22 August 2007

The public participation meeting in Swakopmund was preceded by a presentation of the project to the media. All three meetings were conducted in an open-day format, which gave the public an opportunity to view posters of the project, and to raise questions with the specialists who were in attendance. Attendance registers for these meetings were compiled and all attendees whose names and contact details are legible have been included in the list of registered I&APs (Annexure I). The original attendance lists are available on request.

As far as focus group and key informant meetings are concerned, a full list of these, together with minutes from the meetings, are provided in Annexure F and Annexure G respectively.

Regarding stakeholder feedback and ongoing involvement, a record of stakeholder comments, whether these were questions or concerns, has been compiled in a form which records the comment, the name of the commentator, the form the comment took and the response thereto. This is a comprehensive list of comments made at all the meetings held during the public participation process, as well as comments submitted in writing. The stakeholder feedback forms are provided as two sheets in Annexure H of this report.

All I&APs who have registered themselves since the initiation of this project are listed in Annexure I.

Stakeholder awareness has been maintained through reports on progress wherever feasible, responses to written queries, and information dissemination where relevant. In all respects, there has been a productive two-way dialogue between the SEIA team and stakeholders.

For ease of reference, all correspondence to date is summarised in Table 3 on Page 40.

### **3.4 PUBLIC PARTICIPATION WAY FORWARD**

During the SEIA stage that will follow the present Scoping stage, public participation and engagement will comprise the following:

- engage with I&APs who were not included in the Scoping stage participation process,
- present the findings of the draft SEIA Report,
- register any additional I&APs,
- note and respond to questions and/ or issues of concern, and
- investigate issues at greater depth where the need for this has been indicated.

All I&APs will be informed of the availability of the draft SEIA Report, the period for review and the venues where the report will be available.

The draft SEIA, including the specialist studies, will be presented to the public at public participation meetings in Arandis, Swakopmund and Walvis Bay during January 2008. At the same time, copies of the draft SEIA Report will be lodged for public viewing at the libraries in Swakopmund and Walvis Bay, and at the Arandis Town Council offices. The report will also be placed on RUL's website.

All I&APs will be informed of the results of the public review of the draft SEIA Report.

**Table 3: Summary of correspondence and documentation to date**

<b>Project Activity</b>	<b>Dates</b>	<b>Notices</b>	<b>Letters</b>	<b>Documents</b>	<b>Meetings</b>
Project Preparation	14 June 2007			Minutes of meeting	Multistakeholder Risk Identification Workshop, Swakopmund.
Project Initiation	August 2007				Meetings with authorities.
Initiation of Public Participation		Newspaper adverts. Awaiting information. Notices in public places in Arandis, Swakopmund and Walvis Bay	Notification of project & invitation to stakeholders' meeting.	PID	Meeting with media.
	20-22 August			Stakeholder Issues Sheet (1)	Public Participation meetings in Swakopmund, Walvis Bay and Arandis.
	23 August – 22 September			Minutes of meetings. Stakeholder Issues Sheet (2)	Key informant and focus group meetings.
Notification of Scoping Report	26 October 2007	Notification of release of Scoping Report in print media.	Letters to I&APs notifying them of release of Scoping Report.	Scoping Report.	

## 4 IDENTIFICATION OF ALTERNATIVES

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### 4.1 CONTEXT

The identification and consideration of alternatives is recognised as required practice in environmental assessment procedures globally. Regulatory requirements in Namibia accord with this requirement, as reflected in the Environmental Assessment Policy, *viz.* as a step in the earliest proposal development stage<sup>12</sup>.

Alternatives are typically considered at various stages in the formulation of proposed developmental policies, plans and projects. With reference to policies and plans, these are usually addressed at the higher level of national and regional strategy and forward-planning. As far as RUL's proposed expansion project is concerned, and as the name implies, project-level alternatives are assessed specifically at the project level. It is these alternatives that are put forward and described in this Scoping Report. Part of the Scoping process is to screen out those alternatives that will not be considered in the SEIA Report stage. Unless there is valid and logical justification to screen them out, all feasible alternatives should be considered in the SEIA Report stage.

During the next stage in the process, i.e. the SEIA Report stage, each of the selected alternatives will be assessed in terms of their potential impacts on the socio-economic and biophysical environment. The formulation of mitigation measures to reduce the significance of negative impacts is a key part of the assessment process. In deriving mitigation measures, process modifications to the preferred alternatives may be made.

At the end of the SEIA process, RUL would be able consider the assessment of the alternatives described in this section, together with any mitigation measures that are proposed, to select preferred options to submit to MET:DEA for their clearance.

### 4.2 STRATEGIC ALTERNATIVES

As contextualised in the previous section, strategic alternatives refer to those alternatives that were considered at a higher level than this project-level SEIA. In this case, and as described in Section 1.2 above, the Constitution of the Republic of Namibia, Vision 2030, the Environmental Assessment and Management Act and RUL's Sustainability Assessment provide the overarching policy and planning framework within which RUL's strategic decisions have been made. The present SEIA is thus part of the re-evaluation of the life of the Rössing uranium mine, beyond the present target date of 2016, in terms of overall feasibility, i.e. including social and environmental criteria.

While there is also a requirement in terms of environmental best practice to examine the "no go" alternative, this option would amount to the Rössing uranium mine closing in 2016. With the

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<sup>12</sup> See Section 3 of Appendix A of the policy.

current opportunity of deriving strategic, economic and social benefit from prolonging the life of the mine, not taking up this potential opportunity is considered to be an unreasonable alternative. As a result, the “no go” alternative is not being evaluated at the same level of comparative detail that the project alternatives reflected in this report are. Rather, the status quo forms the baseline against which potential positive and negative environmental impacts of RUL’s proposed expansion project are assessed.

### 4.3 PROJECT-LEVEL ALTERNATIVES

Each of the three components of Phase 1 of RUL’s expansion project, i.e. a sulphuric acid plant and associated storage and transport, a radiometric ore sorter plant and the mining of the SK4 ore body, are now described in terms of the project-level alternatives available for assessment<sup>13</sup>. A summary of these alternatives is provided at the end of this section.

#### 4.3.1 Sulphuric acid plant and associated handling, storage and transport

##### a) Site

A site for the proposed acid burning plant on the mine has been identified, viz. within an area presently used as the salvage yard<sup>14</sup>. See Figure 10. A decommissioned<sup>15</sup> acid plant is in existence in the same general area but its intended dismantling and removal will later be subjected to the required occupational health and safety prescriptions, which may include the decontamination of polluted substrate. Although the timing of the removal of the redundant acid plant forecloses on utilising the same site for the proposed new acid plant, the severely changed nature of the area, within the transformed, brownfield mine processing precinct, means that there is no lost opportunity from an environmental perspective. Nevertheless, the exact location and orientation of the proposed acid plant within the greater salvage yard area will be subjected to technical and economic optimisation insofar the effects of air quality, human risk, engineering cost and infrastructure integration are concerned. Due to practical considerations related to existing infrastructure, no array of alternatives that would bring significant environmental benefit is thus available. Adherence to best practice will be satisfactory in the siting of the proposed acid plant on the mine.

The manufacture of sulphuric acid requires elemental sulphur feedstock and this would have to be imported via the Port of Walvis Bay and transported to and stored at the proposed acid burning plant on the Rössing mine. A separate environmental assessment process is being undertaken by Grindrod Limited, the lessees from Namport of the bulk handling facility in the port<sup>16</sup>, for their proposed sulphur handling and storage infrastructure. RUL has nevertheless

<sup>13</sup> Note that the remaining expansion project components will be dealt with in a separate process that is subject to a different programme, as described in Sections 1.1, 1.5 and 2.1 above.

<sup>14</sup> Note that the site will need to include space for the handling and storage of sulphur feedstock.

<sup>15</sup> March 2000.

<sup>16</sup> Note that Namport, the Namibian port authority, remain in ultimate charge of contractors’ and lessees’ activities within harbour precincts they are responsible for. Both the Grindrod Limited and RUL development proposals within the Port of Walvis Bay will thus have to be acceptable to Namport.

included the assessment of sulphur handling and storage in the port in the SEIA for Phase 1 of their expansion project, to accord with best practice insofar assurance of acceptable environmental standards on the part of commercial suppliers is concerned. This will include an examination of the site within the Port of Walvis Bay that Grindrod Limited envisage for the sulphur handling and storage facility, although such examination will be in response to a site indicated by Namport - and subject to their own environmental assessment process - and will not extend to the consideration of alternative sites.



**Figure 10: Overlain on an aerial photograph, the proposed location of the new RUL acid plant relative to the old acid plant and other related sulphuric acid producing infrastructure** (source: RUL public participation material, 2007)

#### b) Handling, storage and transport

It is understood that RUL's responsibility for managing the elemental sulphur feedstock for their acid plant will commence at the point at which it is loaded onto railway wagons at their facility in the Port of Walvis Bay, for transport to the mine. However, its handling and storage in the harbour will be undertaken by Grindrod Limited, as indicated in the previous section. It is being included in the present SEIA for the sake of completeness of reporting and integration of related activities for environmental decision-making. Based on the assumption that such handling and storage will primarily accord with globally recognised best practice, and that the activities would occur within an industrial precinct, it is unlikely that an array of alternatives will need to be examined in this regard. By the same token, the handling and storage of sulphur in proximity to the acid plant on the mine would also not present site or technological alternatives, provided that appropriate engineering design and operational best practice are applied.

The transportation of the sulphur by rail to an offloading and storage facility in the vicinity of the acid burning plant on the mine will require purpose-designed rail wagons. Clarity regarding the means of loading, as well as whether side-tipping or bottom-opening emptying of the wagons will be utilised, has yet to emerge. While this is largely an engineering design issue, it may present alternatives that could be gainfully subjected to environmental assessment.

With reference to the storage of sulphuric acid produced by the proposed acid plant, prior to its application in the metallurgical process for the leaching of the pulped ore, this will occur in two existing tanks of 15 000 t each, designed for the purpose.

### c) Technological alternatives

A recent outcome of the various feasibility studies undertaken or commissioned by RUL regarding the optimum and most appropriate technology to apply in the proposed acid burning plant is the order of magnitude study carried out by SNC-Lavalin Fenco (2007). Five different options were considered in this study, namely:

- Option 1: Base case double-contact double absorption system with electricity generation from waste heat and a production rate of 250 kt/a.
- Option 2: Base case but doubled in output to 500 kt/a.
- Option 3: Base case but waste heat used for desalination<sup>17</sup>.
- Option 4: Base case but waste heat used as process heat in leaching plant.
- Option 5: A dual-feedstock system, i.e. either pyrite or sulphur can be used to manufacture sulphuric acid.

At this time, the preferred option from a technological point of view is an acid plant per Option 1, located on site and producing 1 200 t/d, as described earlier in this section. However, the options will be subjected to review, to confirm that biophysical and socio-economic issues would not necessitate a revision of the technological preference.

A related technological issue is whether air or water cooling should be applied in the acid burning plant. Although the heat resulting from the exothermic nature of acid production will be utilised for electricity generation, cooling will nevertheless be necessary.

As far as the optimal emission stack height of the acid plant is concerned, this will be largely informed by the outcomes of the air dispersion modelling described in Section 6 below. Stack height alternatives of 50 m and 75 m are to be examined and the overriding criterion in this case is that risk to human health is avoided.

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<sup>17</sup> Note that this option would require the plant either being located on the coast or such that seawater could be supplied to it in bulk.

### 4.3.2 Radiometric ore sorter plant and associated reject rock disposal

#### a) Site

A site for the proposed radiometric ore sorter plant has been identified in the area west of the conveyor running between the existing coarse ore stockpile and the series of crushers and screens where the present pilot ore sorter plant is located. See Figure 6. Since the area is within a largely transformed space between the mining operations and the processing plant, and contains various linear utilities, the technical and engineering criteria that informed the choice of site are unlikely to be influenced by environmental concerns.

Nevertheless, the exact location and orientation of the proposed ore sorter plant will be subjected to environmental review insofar the effects of air quality, human risk, noise and visual impacts are concerned.

#### b) Technology and design

The technology employed to radiometrically select higher grade ore from the ore stream is sophisticated. Given that such technologies represent leading-edge science and that research is continually being undertaken to advance the technology, their application is such that a variety of alternative technologies is not available.

An element of the plant design, however, may present alternatives. This is related to the arrangement of the pre-screening units, which may be positioned vertically, i.e. stacked one above the other, or horizontally, i.e. in series at the same level. Issues of engineering cost are relevant but concerns about visual intrusion of the vertical arrangement and the physical space required for the horizontal arrangement, may require these to be assessed as alternatives from an environmental perspective.

The nature of the transportation, screening and sorting of ore results in considerable noise and dust impacts. The compressed air pneumatics that separate the accept and reject rock streams, and the discharge points of conveyors, are two particular cases in point of sources of noise and dust respectively. Although these impacts will be subjected to mitigation as far as is technologically and economically feasible, the primary criterion will be the meeting of applicable occupational and public health and safety standards. The mitigatory measures may include enclosing the plant or certain components of it, as well as noise attenuation and fugitive dust capture. These proposed measures would be subjected to environmental review rather than treated as alternatives, since they are a means of achieving acceptable levels of mitigation.

#### c) Reject rock disposal sites

RUL has in the past undertaken various studies to identify possible sites for the disposal of the reject rock from the proposed radiometric sorting process. The most recent of these studies

(Rio Tinto Technical Services, 2005) addressed seven possible locations, illustrated in Figure 11 below, as follows:

- Location A ~ The tailings dam;
- Location B ~ Below the southern toe of the tailings dam;
- Location C ~ The valley and areas adjacent to the grit-blasting yard;
- Location D ~ The mine waste dump designated *Waste 5*;
- Location E ~ The upper area of Dome Gorge;
- Location F ~ Northwest of the salvage yard on the slopes of the Berning Range; and
- Location G ~ South of the Seepage Dam access road.

However, certain of these locations are inherently flawed or have significant constraints. This is due to their impacting on the management of the tailings dam and its seepage (Locations A and B), limiting the exploitation of ore (areas within Locations D and G), foreclosing on possible sites for heap leaching (Location E), or posing infrastructural and visual impacts (Location F).

An engineering cost study is underway to determine the most beneficial means of transporting the reject rock, i.e. whether by truck or conveyor. Initial indications are that trucking may be preferable within a distance of 3 km.

The possibility of utilising existing, designated waste rock disposal areas is also being kept as an option.



**Figure 11: Location of the initial reject rock disposal sites** (source: RUL)

### 4.3.3 Mining of the SK4 ore body

Given that the development and exploitation of the SK4 ore body would essentially comprise an extension of present mining activities within RUL's allocated mining licence area, the availability of alternatives is limited. The envisaged method of mining, as described *inter alia* in Section 2.4.2 above, accords with current and approved practice on the Rössing mine and, as such, may be regarded as acceptable practice. There are certainly no feasible alternatives available insofar geographical location and mining methodology are concerned. The ore derived from SK4 would be subjected to the current metallurgical beneficiation process<sup>18</sup> applied on the mine, further limiting the availability of alternatives during the exploitation of the ore body.

Environmental controls required during the exploitation of the SK4 ore body would be based on mitigation measures and operational management practices currently in place on the mine. These comprise the occupational health and safety issues of noise, dust and radiation management and monitoring, and the socio-economic and biophysical issues of hydrology, heritage, biodiversity, visual and human resources impact management.

Based on the above, and with reference to the project description provided for SK4 earlier in Section 2.4, it appears that there are only three areas that may require the assessment of alternatives. These are the final formulation of the design and geometry of the haul road alignment, the ability of current waste disposal sites to accommodate the envisaged waste rock, and the means by which water for dust suppression and drilling are sourced and their runoff managed.

It should be noted that the engineering design refinement and finalisation of elements of the SK4 mining operation have yet to occur. The SEIA stage of the process that follows the present Scoping stage will provide an opportunity to incorporate new and/or additional information.

### 4.3.4 Other project level alternatives

The previous three sections have dealt with the acid plant, ore sorter and SK4 mining in particular. However, there are several potential environmental impacts that cut across the entire Phase 1 SEIA. These mainly relate to socio-economic issues that are common to the specific components of the expansion project. These are now briefly described insofar possible alternatives may be available.

Housing for additional permanent employees and temporary construction workers would be required. The options available for formal housing are unlikely to present an array of alternatives. The temporary construction camp/s may benefit from the consideration of possible mitigatory measures in terms of location and service provision.

The availability and adequacy of social services such as schools and medical care, to accommodate the increase in the numbers of employees, need to be examined. A related issue is the ability of existing infrastructure services such as domestic water supply, waste

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<sup>18</sup> As opposed to the ore eventually derived from the SH ore body, which would require a different metallurgical beneficiation process, to be dealt with in detail in Phase 2 of RUL's expansion project SEIA.

management, electricity supply and transport services to accommodate the increased demand. The degree to which the provision of these services can be examined in the present SEIA process is dependent on regional resource availability and planning. This will require attention to off-site and cumulative impacts and will be addressed as part of the socio-economic specialist study.

Also important in the regional context is the fact that several uranium mining developments are presently underway in the Erongo Region. Managing the social, infrastructure and resource issues mentioned above would benefit by a strategic or sectoral approach to their assessment. While the present SEIA will address cumulative and sectoral impacts as far as possible at the project level, RUL would require co-operation from national, regional and local authorities, interested stakeholders, and the other uranium mining companies, if a properly integrated approach is to be brought about.

Due to the difficulty of addressing cumulative and sectoral impacts, the present SEIA process will be undertaken in an adaptable manner, to allow for new or additional information to be incorporated as the process unfolds.

#### 4.3.5 Summary of available alternatives

The following table provides a summary of the project-level alternatives that have been identified during the present Scoping stage, for further assessment during the SEIA Report stage of this assessment process.

Project component	Aspect
Acid plant & related handling, storage & transport of sulphur feedstock	Design of handling & storage facility in Port of Walvis Bay
	Design of rail wagons required for sulphur transport
	Stack height of acid plant
Radiometric ore sorter plant	Vertical or horizontal arrangement of pre-screening units
	Suitable disposal site for reject rock
SK4 ore body	Haul road design and alignment
	Waste disposal
	Water management

**Table 4: Project-level alternatives to be carried forward into assessment stage**

These aspects of the listed Phase 1 SEIA project components will be subjected to the consideration and evaluation of alternatives in the assessment stage of the process. The aspects that do not have alternatives will nevertheless also need to be assessed. This will be done by means of determining that acceptable levels of mitigation are available, or by confirming that the best available environmental design or practice is being applied.

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## 5 THE AFFECTED ENVIRONMENT

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This chapter was compiled from a synthesis of the following reference materials:

- Rio Tinto Technical Handbook Series. 2002
- Rössing Closure Report. 2005
- Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2004.
- 2006 Report to Stakeholders. 2007.

### 5.1 SOCIAL ENVIRONMENT

#### 5.1.1 Rössing Employees

The RUL employment figure for 2007 is reported as 1076. During 2006 it was indicated that 96.6% of RUL's employees were Namibian citizens, and it is estimated that more than 4000 persons (including workers and their direct dependants) rely on Rössing Mine for their livelihood. As a result of a low labour turnover rate and the tendency for retrenchments to occur predominantly within the lower age groups, the average age of RUL worker in 2003 was 47, but this is improving as compared to the average age of 43.6 and 43.1 in 2005 and 2006 respectively.

Of the 310 RUL workers living in Arandis in 2003, 66% own their own houses, bought from the mine in 1994, whilst the remainder continue to live in company-owned housing. The Arandis-based workers tend to be the lower skill grade workers and can afford the substantially cheaper properties sold by the mine. The remaining 500 workers live in Swakopmund, where property prices are five to ten times that of the Arandis properties, and where 333 workers own their own houses and the remainder live in company-owned houses.

Changes at the Rössing mine can have a significant effect on the employment rates and thus the social environment in the Erongo Region. It has been previously estimated that, provided the mine does not close or suffer other major economic hardships, the number of workers employed by RUL would increase to an estimated 1333 by 2010 and to then remain reasonably constant for the foreseeable future. This approximation stands to increase, as in 2006 it was envisaged that the number of permanent employees at Rössing by the end of 2007 would exceed 1000.

RUL has continually contributed to the development of its workers and the surrounding communities through their corporate social responsibility framework, centred on the establishment and funding of the Rössing Foundation. The Foundation is primarily involved with education, vocational training, skills development, small and medium enterprise development, agriculture and sustainable resource management in an effort to encourage a sustainable and self supporting local economy in the future absence of the mine.

### 5.1.2 The Erongo Region

The Erongo Region has experienced dramatic population growth in its larger urban centres, namely Walvis Bay and Swakopmund, since Namibia's independence. In 2000, the unemployment rate for the Erongo Region stood at 32.6% and much of this is attributed to migration from other Regions. The unemployment rate has resulted in the proliferation of informal settlements in and around urban centres. The Erongo Region boasts the third highest Human Development Index ranking in Namibia, as well as having the second lowest level of household poverty and a mean per capita income almost twice the national average.

### 5.1.3 Social Services

The Erongo Region has a relatively high level of social service provision, despite the rapid population growth rate.

#### Household water

In 2004, 100% of urban households in the Region are served with improved water and in rural areas, 89% of households are within the government stipulated distance of 2.5 km from an improved water source, making the Erongo Region the second highest Region in Namibia with regard to the provision of improved water to individual households or to within acceptable distances from households.

#### Health services

The Erongo Region has four state and three private hospitals, one health centre, fourteen clinics and seven outreach points, placing 98% of the population within ten kilometres of a health care facility.

HIV/AIDS-related deaths are the leading cause of death across the adult age group. In 2002, HIV/AIDS prevalence varied from 25% in Walvis Bay to 16% in Swakopmund and is similar to the national infection rate of 23.3%. HIV/AIDS is a burden on Government budgets due to increasing health care costs affiliated with AIDS related deaths, the loss of productivity of the working class, increased costs associated with training of replacement personnel, increased pension costs, increased sickness benefits and death benefits amongst other costs. Namibia is prone to the economic impacts of HIV/AIDS due to the shortages of skilled and semi-skilled personnel. The affects of HIV/AIDS have been felt in the fishing, tourism and construction sectors in the Erongo Region.

On the household and community economic level, the affect of HIV/AIDS is even more dramatic, where lost incomes have reduced disposable incomes and lowered consumptive spending, as well as depleted household savings. This causes many family groups to fall into or regress further into a state of poverty. Family groups within the community not directly infected by the virus are affected by the need to care for orphaned children or in supporting neighbours financially.

## Education services

As of 2004, the Erongo Region was relatively well served by education services as compared with other Namibian Regions. The Region had at that time a total of 56 schools, nine of which are secondary schools. The Erongo Region has the lowest pupil to teacher ratio in Namibia.

## Other services

The Erongo Region, particularly the coastal towns of Swakopmund and Walvis Bay, is well served with transport infrastructure, police services and productive services in the agricultural, fishing and small-scale mining sectors, amongst others.

### 5.1.4 The Arandis Community

Arandis was established in 1976 by RUL for mine workers and their families. In its early years the town was well-equipped with modern infrastructure including schools, a health centre and sporting and recreational facilities. Municipal services, including electricity and water, have been heavily subsidised by RUL. In 1994 Arandis was proclaimed as an independent town with an elected Local Authority falling under the Ministry of Regional and Local Government and Housing. The new Town Council has experienced problems in coping with its new responsibilities arising from a weak tax base and insufficient economic activity and has thus remained reliant on central government for financial support in meeting its operational costs and service provision responsibilities.

The Town Council and other partner organisations have embarked on a vigorous campaign to seek out and encourage investment and development in the town. Arandis has been promoted as an Export Processing Zone, has tried to attract Namibian enterprises and has tried to encourage local small enterprises. Arandis is also home to the Namibian Institute of Mining and Technology, established with the support of RUL. The Town Council has considered establishing Arandis as a centre for educational excellence and plans to this end are currently being implemented. Key to this is the Rössing Foundation, established in 1978 as part of RUL's CSR (Corporate Social Responsibility) programme, and mainly focused on advancing education facilities and initiatives. Around 2004 a decision was taken to focus approximately 75% of the Foundation's core finance toward projects located in Arandis in an effort to invigorate the local economy. To this end, the Foundation is implementing a strategic plan that focuses on Arandis and the need to establish effective community institutions, support community initiatives and expand educational opportunities in the town. The Foundation has been working with the Arandis Town Council to broaden the economic base of the town, including the proposal to establish a cultural village, a small enterprise fund for seed capital and promoting the growth of small and medium enterprises in general. In addition the Foundation has strengthened the library facilities at the Town's schools and at the Foundation's offices in Arandis. Computer facilities have been provided and a key objective is to promote computer literacy and skills development. In 2006 Rössing mine contributed N\$15,103,000 to the Rössing Foundation; The Rössing Foundation's activities were reviewed during April 2006. Following this review, a new reporting structure and areas of focus were introduced and became operational in

December 2006. Education became the primary focus area, while work with the Arandis Town Council was regarded as crucial to the sustainability of Arandis. Following this, a decision was taken that Rössing would assist the Arandis Town Council in selected infrastructure development projects while the Rössing Foundation would focus on capacity-building (Source: <http://www.rossing.com>, 2007).

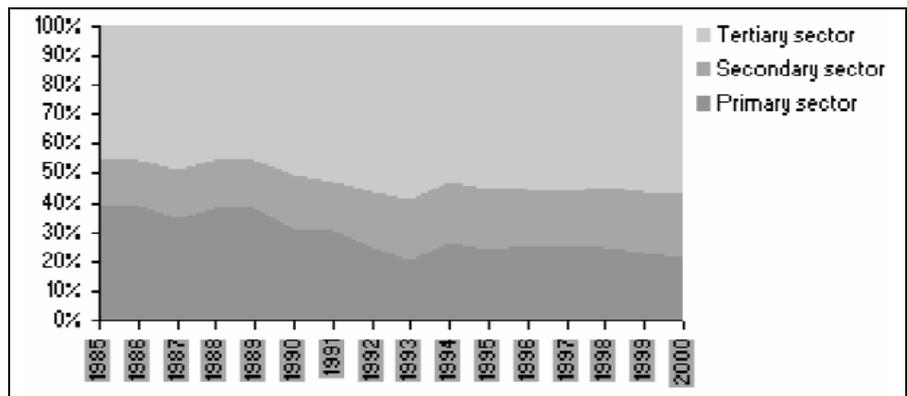
Previous social assessments associated with RUL’s closure and expansion investigations have indicated that, based on public opinion; there remain serious challenges with regard to ensuring the long term sustainability of the town. Many people would like to continue to live in the town if a sufficient and diversified economic basis from which to make a livelihood exists.

## 5.2 Economic Environment

RUL is a major contributor to the Namibian economy and is central to the local economy. Mine closure and mine extension could have significant economic impacts to both the national and local economies.

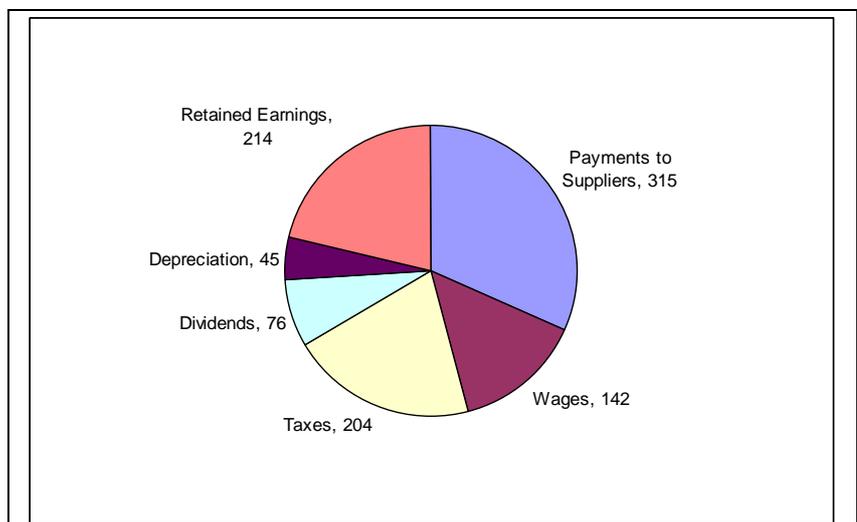
### 5.2.1 RUL in the Namibian economy

Since independence in 1990, Namibia’s economy has stabilised and is now considered to be a mid-income level country, although the distribution of wealth is far from uniform with a 35% unemployment rate and 55% of the population living on less than US\$2 per day (World Bank Development Indicators, 2001).



**Figure 12: Sectoral Contributions to the Namibian GDP** (Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2005)

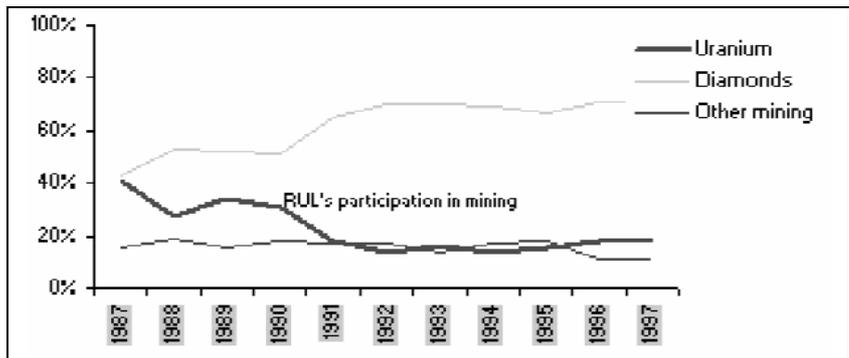
Namibia is heavily reliant on the primary sector for its Gross Domestic Product, although a slow progression toward a less mining-based economy has been occurring during the past 15 years or more. During this period, the rate of growth of the mining sector has diminished and there has been an upsurge in the services and manu-



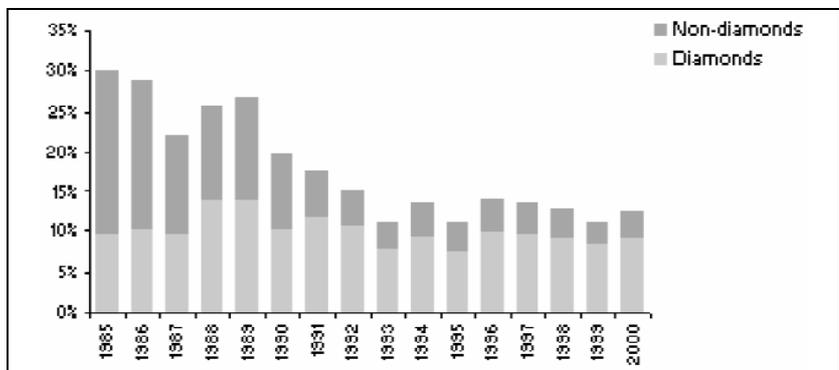
**Figure 13: Rössing Mine's economic contributions in N\$ millions** (Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2005)

facturing sectors. Figure 12 (previous page) depicts the sectoral contributions to the Namibian Gross Domestic Product during the period 1985 to 2000.

Figure 13 (previous page) depicts RUL’s total and direct economic contributions in 2001. This only accounts for the direct contributions and does not take account of secondary and “knock-on” economic contributions arising from RUL activities. RUL, up until the end of 2006, was the only uranium producer in Namibia and thus its indirect contribution to the Namibian economy could be linked to the total uranium production in Namibia. In 1987, RUL contributed 10% to the Namibian economy and this declined to around 2.5% of Gross Domestic Product in 2001, or N\$1,000 million, 68% in the form of value added and 32% in the payment of suppliers.



**Figure 14: Rössing Mine's contributions in context with the Namibian mining sector** (Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2005)



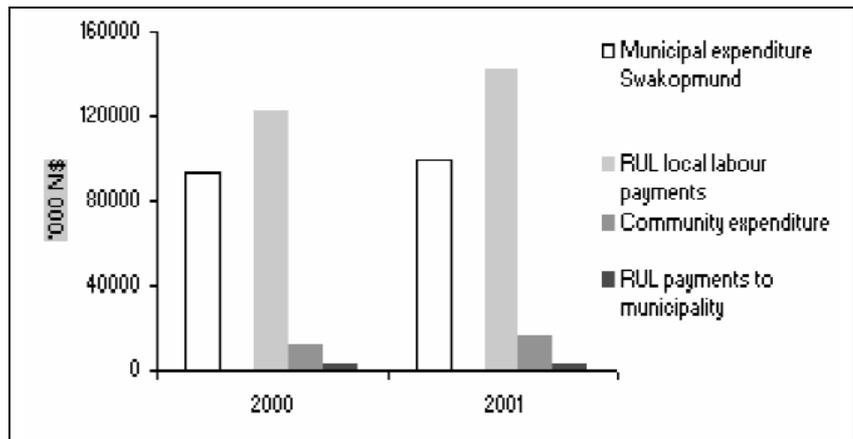
**Figure 15: Namibian mining sector's contribution to the Namibian GDP**(Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2005)

In 2004, Rössing mine accounted for 10% of Namibian exports (down from 26% in 1985) and was valued at 20% of the Namibian mining sector where the total contribution of the mining sector to the Namibian economy is estimated at 13%. Rössing mine was the fifth largest global uranium producer in 2001, contributing 6% or 2,643 tonnes of U<sub>3</sub>O<sub>8</sub> to the global market. Since 2001 uranium production at Rössing has increased annually to the 2006 tonnage of 3,617. Figure 14 depicts the contribution up to 1997 of RUL within the context of the Namibian mining sector whilst Figure 15 depicts the contribution up to 2000 of the mining sector to the Namibian GDP.

### 5.2.2 RUL in the local economy

The economic influence of the Rössing mine is far more pronounced on a local economic scale, in particular the centres of Swakopmund and Arandis. Whilst value added contributions, particularly taxes, are injected into the national economy, salaries and wages have a marked contribution at the local economic scale. Payments benefiting employees by Rössing during 2006 amounted to N\$245,593,000 and regional suppliers (within the Erongo Region) received N\$489,900,000 in that year. Rössing paid N\$158 million to the Namibian Government in 2006 in companies taxes. The contributions of RUL to the local economy is put into perspective in Figure 16 where selected contributions from the mine are compared with Swakopmund's

municipal expenditure for 2000 and 2001. Reducing uranium prices resulted in Rössing mine running at a loss for 2003 and 2004 and realising a marginal profit in 2005. An improving uranium market price to 72 US\$/lb resulted in an after tax profit of N\$304 million in 2006 and reinvigorated the potential for the continuance of the Rössing mine.



**Figure 16: Selected Rössing mine contributions in comparison with Swakopmund municipal expenditure**(Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2005)

Swakopmund came to the fore as a holiday destination in the 1940s and its development accelerated with the inception of the Windhoek to Swakopmund road in 1967 and again in the 1970s with the inception of the Rössing mine. Swakopmund currently has a population of around 28,522 people (Source: <http://world-gazetteer.com>, 2007), and whilst RUL still has a marked influence on the economy, the town has diversified its economy into commerce and tourism and, to a lesser extent, manufacturing. Registered businesses climbed from a stable 140 units in the 1970s (pre- Rössing mine) to 194 and 368 in 1980 and 1991 respectively. The number of registered businesses collapsed in 1992 in conjunction with a major downsizing at RUL and then increased dramatically in 1998 to 504 units and continued to increase to 729 by the year 2002. The second major downsizing at RUL mine did not impact negatively on the business registration rate in Swakopmund, potentially indicating a developing independence and diversification of the economy and increasing resilience to the potential economic impacts arising from the closure of Rössing mine.

The town of Arandis on the other hand remains heavily dependant on RUL. The town is currently home to approximately 4 500 people of which 66% are directly and indirectly reliant on RUL mine for their livelihood. The remaining population relies on one of two clothing factories (employing 165 persons), a water metering factory (12 employees), a few local shops, civil service and the Town Centre. Regardless of the distance, many Arandis residences still rely on Swakopmund for their shopping needs. The future of the town of Arandis is perhaps the most significant social economic issue associated with the proposed extension of the life of the Rössing uranium mine.



### 5.3 BIOPHYSICAL ENVIRONMENT

#### 5.3.1 Site Location, Extent and Context

The Rössing uranium mine is located in the Erongo Region, which comprises the central western part of Namibia, and is bordered by the Atlantic Ocean to the west, the Kunene Region to the north, Otjozondjupa Region to the north east, Khomas Region to the east and the Hardap Region

to the south. The Erongo Region consists of seven constituencies covering approximately 64,000 km<sup>2</sup> and is home to almost 108,000 people or approximately 6% of Namibia's populace in 2001. In 2007 the Erongo Region's population was calculated at 147,441 people (Source: <http://world-gazetteer.com>, 2007). The majority of this population reside in the two urban centres, namely, the tourist town of Swakopmund and the fishing and major port town of Walvis Bay (75 km SSW of Rössing). Also located within the region are the smaller towns of Henties Bay (88 km NW of Rössing), a coastal tourist town north of Swakopmund, and Arandis, a mining town associated with the Rössing mine. Notwithstanding these urban centres, the smallholdings located on the lower Swakop River (50km SW of Rössing), twelve farms located between the Khan-Swakop confluence and the farm Tannenhof, and the farms located between there and the former Rössing Country Club, much of the land remains uninhabited and unproclaimed, apart from the designated National Parks and state controlled recreational areas further to the west. This sparse inhabitancy and land use pattern in the surrounding areas arises from the lack of surface and ground water and associated low agricultural potential that characterises the area.

The Rössing mine site itself is found at 15° 27' 50" East and 22° 02' 30" South, approximately 65km east north east and inland from Swakopmund and the Atlantic Ocean, in the Arandis Constituency. The 18,411 ha licensed mining and accessory works area is bordered by the town of Arandis, approximately 12 km to the north west and by the incised Khan River valley, approximately 4.5 km to the south east, as seen in the aerial photograph in Figure 17. The site is located on the generally south east-facing, rough and undulating slopes between the Khan River valley (at 350 mamsl) and the gravel plains closer to Arandis (at 600 mamsl) near the eastern edge of

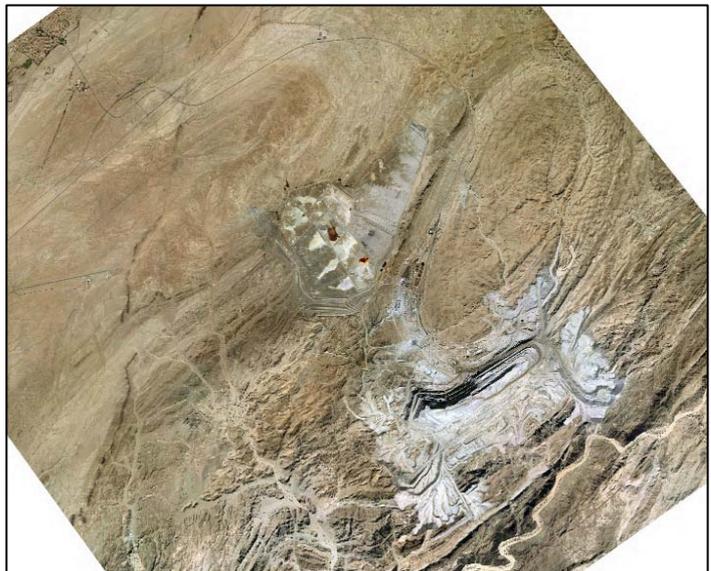


Figure17: Aerial photograph of Rössing mine (source:RUL)

the Central Namib Desert. The topography is characterised by a series of steeply incised valleys, tributaries of the Khan River, intersecting the site and running in a northwest-southeast alignment. Of the licensed mining and accessory works area, approximately 2,165ha (11.4%) has been disturbed by mining activity, mining waste disposal and mine infrastructure to date.

### 5.3.2 Mine Infrastructure and Processes

The approximate 2,165ha physical mining footprint comprises of the open pit, uranium extraction plant, tailings dam, waste rock dumps and infrastructure, all of which can be seen in Figure 17. Besides the open pit and processing plant, the mine infrastructure in general is comprised of the following:

- A double-lane tarred access road from the main Swakopmund-Usakos road;
- A full gauge railway line linking the mine's services areas with the main Windhoek – Usakos – Swakopmund – Walvis Bay railway line;
- Water supply pipelines and storage reservoirs;
- Connection lines to the Nampower 220kV power line supplying Swakopmund and Walvis Bay;
- Sewage treatment works;
- Storage facilities for diesel and explosives, acid, solvent, petrol and ammonia;
- Workshops, laboratories, personnel, medical and administrative buildings;
- Various untarred access and haul roads linking the lower portions of Dome, Pinnacle and Panner Gorges to the central mine operation area.
- Borehole pumping and monitoring stations along the Khan River.

### The open pit

The Rössing open pit, opened in 1976, is roughly rectangular in shape, 3,060 m long by 900 m wide. In 2007 the open pit had reached 390 m in depth measured from the highest bench, comprised of 26 benches of 15 m in height, using a conventional drill, blast, load and haul operation.

Pit life is estimated to terminate in 2016 or beyond, depending on uranium prices, operating costs and the realised output from the ore body. Future pit expansion from the present mined area will take the form of mining push-backs on all walls of the present pit so that the final pit will be considerably extended in area and a pit depth of approximately 500 m will be achieved eventually. (Rio Tinto Technical Handbook Series. 2002)



**Figure 18: Aerial photo of the Rössing open pit** (source: RUL)

### The rock disposal areas

During 2006, waste rock comprised 58% of the rock mined at Rössing during the year. This high proportion is due to the requirement of having to remove surface material to expose underlying ore rock. Waste rock consists primarily of barren country rock and of sub-economic uranium ore, as determined by the in-pit radiometric scanners. The waste rock varies in consistency from large boulders to finer sands and gravel-sized particles.

At the end of 2006, the footprint area of the various rock disposal areas amounted 658 ha. These are comprised of number waste rock disposal areas and a number of low and high-grade-high-carbonate content (high calc) stockpiles in close proximity to the open pit. The low

grade and high calc stockpiles are situated on top of inactive waste rock dumps, where they remain accessible for potential future uranium extraction.

All of this material is transported by haul truck and disposed of at one of several designated sites surrounding the open pit. The rock dumps are predominantly situated in the valleys and dry river gorges that drain towards the Khan River. Waste dumps 2, 5 and 6 overlie Pinnacle Gorge, while Waste dumps 4 and 7 fill various tributaries of the Dome Gorge system. Rock dumps extend up to 2 km away from the open pit. With the exception of the amphibole schist lithological unit, which comprises a small proportion of the total rock mass mined, the rocks are not prone to weathering. The rate at which mechanical weathering processes act on natural material is measured in geological time; i.e. it is very slow. However, chemical processes affect the rocks, which are covered with residuals from the blasting process in the form of nitrates. Rainwater runoff has the potential to leach these residuals through the rock mass into the underlying aquifers. As a result, control mechanisms have been installed to prevent potentially contaminated rainwater from entering the Khan River. Due to the high carbonate content of some rocks, the low annual precipitation and the coarseness of the rock fragments, stormwater drains through the waste rock dumps rapidly and thus the potential formation of acid mine drainage is very low.

### Tailings dam

All solid waste arising from the uranium extraction process (tailings) are conveyed or pumped to the tailings facility, located the west of the north east trending ridge, effectively separating the facility from the rest of the mine workings. The facility has been in operation since the commencement of activities in 1976 and was approximately 650ha in area in 2005. The tailing dam is 95m at the highest point and the starter wall was constructed using waste rock, effectively damming the upper portion of Pinnacle Gorge. The upper portion of Pinnacle Gorge is intersected by the seepage collection dam wall and the gorge itself is filled with waste rock for a distance of 3km, which acts as a safety mechanism to prevent any solids eroding into the Khan River in the event of a failure of the tailings dam wall.



**Figure 19: Tailings paddocks showing grey and yellow chemical precipitates after dessication (source: RUL)**

Generally the tailings produced by Rössing's activities are coarse, containing a relatively low proportion of fines by industry standard. The tailings, 50 – 58% solids are pumped into one of eleven 30 ha tailings paddocks. Coarser sediments are rapidly deposited and the tailings solution is pumped back to the recycling ponds for reuse in the processing plant. Mine life extension until 2016 will require that an additional 164 million tonnes of tailings be deposited, resulting in the need for the extension of the tailings dam footprint.

After a paddock has dried out chemical precipitates are left behind in the former pond area. The chemical precipitate, powdery in texture, reaches 5 cm in thickness and is comprised of clay, gypsum, iron hydroxides and traces of radionuclide. The dry precipitate is readily picked up during wind velocities approaching 40 km/h and thus there is a need to implement dust control mechanisms which include grading of the precipitates to cover the finer material with the coarser substrata, forming evenly spaced wind breaks and then spraying with a chemical dust-binder.

To prevent seepage from the tailings facility entering the natural drainage lines in the area a number of seepage control mechanisms have been installed, including trenches at the toe of the facility and a plastic core surface water collection dam further downstream. During 2006 this seepage trenches and dam recovered an average of 5 992m<sup>3</sup> per day which was recycled. The alluvial aquifers in Pinnacle, Panner and Dome Gorges are protected by cut-off trenches that intercept alluvial seepage. In 2006 the trenches recovered an average of 135 m<sup>3</sup> of seepage per day. A number of recovery boreholes have been sunk, particularly in the vicinity of Panner Gorge, west of the tailings facility, where bedrock is fractured in places. In 2006, 170 m<sup>3</sup> per day of seepage water was recovered from the boreholes. Boreholes have also been sunk into the tailings dam to recover inventory water and these produced an average of 312 m<sup>3</sup> per day during 2006. Boreholes and trenches around the northern toe of the tailings facility contributed another 672 m<sup>3</sup> per day. During 2006 these systems combined, recovered 1 289 m<sup>3</sup> per day, nearly 100% of the groundwater seepage generated and with no direct discharges into the Khan River having occurred.

### 5.3.3 Topography and drainage

Rössing is located on the generally south-east-facing, rough and undulating slopes at a mean elevation of 575 mamsl near the Western edge of the Central Namib Desert. The topography in the southern reaches of the site is characterised by the several steeply incised and deep storm-wash gullies and gorges that drain into the Khan River to the south, resulting in a rugged and hilly landscape. As one moves north from the Khan River, toward the town of Arandis the storm-wash gullies become less pronounced and are interspersed with resilient rock ridges and occasional inselbergs, resembling a more typical Namibian desert plain.



**Figure 20: West facing arial photo of the Rössing Dome** (source: Rio Tinto Technical Handbook Series: 2002)

The site is divided into two sections by a steep-sided north easterly trending ridge of hills between Pinnacle Gorge and Dome Gorge, rising to 707 mamsl at Westdome Hill. The areas to the north and west of the ridgeline are characterised by rolling hills, whilst areas to the east are more rugged, with crested and steep-sided hills. These hills and ridges continue to the south of the Khan River, where after they dissipate abruptly giving way the gravel plains of the Welwitschia Flats, which covers almost the entire area between the Khan and Swakop rivers up to the confluence between them, an area forming part of the Namib-Naukluft Park.

### 5.3.4 Geology

- The following is an extract from the Rio Tinto Technical Handbook Series: 2002.

The Rössing uranium deposit lies within the central zone of the late pre-Cambrian Damaran orogenic belt that occupies much of central and northern Namibia. The early pre-Cambrian Abbabis formation is overlain by the Etusis and Khan formations of the Nosib group. The Abbabis rocks, which include variegated gneisses, phyllites, recrystallised carbonates and biotite schists, are exposed in the cores of anticlinal or domal structures. Intense deformation and high grade metamorphism are characteristic for the entire district.

The Etusis and Khan formations consist of metasediments that are overlain by marble, biotite-cordierite gneiss, conglomerates and feldspathic quartzite of the Rössing Formation.

Various types of granitic rocks were generated by syntexis and partial melting, and emplaced into the Damaran metasediment sequence some 510 million years ago. Dolerite dykes of Triassic age are prevalent and crosscut all older features.

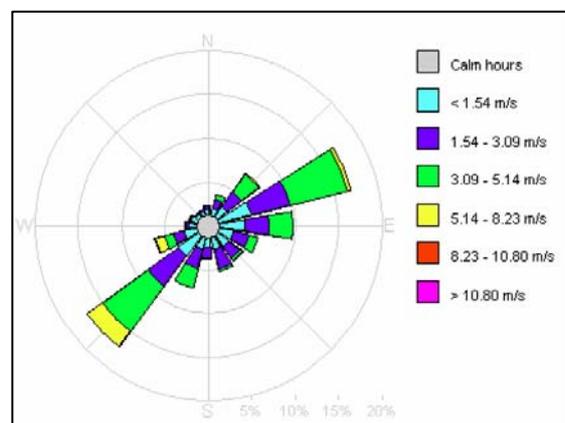
Some migmatitic dome structures contain abnormally high concentration of uranium, giving rise to an increased local, natural radioactivity level. Elevated radioactivity levels can be found in water samples taken from the Khan and Swakop Rivers. The Rössing uranium mine is amongst the lowest grade uranium mines in the world and thus the exposure to radiation is limited. In 2006, no Rössing employees exceeded the International Atomic Energy Agency (IAEA) exposure standard of 20 millisieverts per annum (mSv/a). The additional radiation dose from mining activity has been calculated for Arandis residents at 130  $\mu$ Sv/a (0.13 mSv/a), substantially below the ICRP recommended dose limit of 1000  $\mu$ Sv/a (or 1 mSv/a).

### 5.3.5 Climate

Climatic variance and conditions play an important role in the distribution and type of organisms inhabiting the area as well as the rate of diffusion, direction and distribution of atmospheric pollutants.

#### Wind

Three thermo-topographic wind systems are identified as characterising the Rössing environment, namely the on- and off-shore winds resulting from the cold sea and hot desert. Secondly, the anabatic and catabatic valley wind systems affected by the Khan River valley. Thirdly, the mountain-plain system, brought about by the relationship between the desert plains, plateau plains and their separation from one another by the escarpment.



**Figure 21: Average wind speed and direction measured during 1998 at Rössing mine** (source: Sustainability Assessment for the Life Extension of the Rössing Uranium Mine, 2004)

Berg winds are a fourth and noteworthy wind system affecting the Rössing environment. High pressure cells further inland can cause already warm desert air to cascade off the escarpment, undergoing further heating by adiabatic processes. This results in a super-heated, sometimes high velocity off-shore wind, approaching 125 kms/h, the key factor affecting the Aeolian erosion and deposition processes and gives rise to the characteristic dust storms of the Namib Desert.

Predominant winds at Rössing, listed in order of magnitude, are the south westerlies, the north easterlies and the easterlies. The 1998 wind rose shown in Figure 21 illustrates the predominant wind direction and velocities.

The wind systems at Rössing are the pivotal influencing factor affecting the extent and direction of the dust plumes emanating from the Rössing mine site. The tailings dam, coarse ore stockpile, fine ore conveyor belts and the crusher plant area, despite engineering controls, generate significant quantities of dust that are picked up by the wind and dispersed across the site.

### **Precipitation and evaporation**

Rainfall in the Central Namib Desert region is very low. The average rainfall for the region over the long term is less than 100 mm per year but due to the erratic distribution, much of the area receives less than 50 mm per annum. This variance is seen by the 400 mm falling in the headwaters of the Khan versus the 200 mm at Usakos and a mere 35 mm at Khan Mine. The average annual rainfall at Rössing mine is between 30 mm and 35 mm. Much of this rainfall is received in late summer and early autumn in the form of high intensity, short duration showers or thundershowers. Virtually no rainfall occurs during the winter months. This erratic rainfall pattern combined with the topographic and ecological environment creates a situation where flash-flooding is a risk.

Evaporation rates near the Rössing mine are very high, and have been recorded at between 6 mm and 15 mm per day during the hot December month with lower rates outside of this time and at this evaporation rate the entire annual rainfall, if left exposed at the surface, would dry up in a couple days. The imbalance between annual rainfall and annual evaporation losses is the keystone around which all considerations relating to Rössing's water management program are orientated.

### **5.3.6 Ecology**

The mine is located towards the eastern edge of the Central Namib Desert vegetation zone. A marked east-west vegetation distribution pattern is evident, closely related to the inland distribution of coastal fogs, which can penetrate as far inland as the mine. All plant species found here are considered to be drought tolerant, drought resistant or succulent. Livestock grazing has extensively modified the vegetation in the Swakop River. The large mammal species found in the area are considered to be nomadic, moving widely and entering an area when food is plentiful after rains. Short-lived annuals, which occur after local rainfalls and floods, provide a vital source of good quality grazing for plains game. Klipspringers are frequently seen around the Khan River gorges, whilst Gemsbok, Springbok and Hartmann's

Zebra are occasionally seen at natural seeps along the Khan River. Dassies, Black-backed jackal and troops of Chacma baboons have been observed in Panner and Pinnacle Gorges. The environment is particularly rich in insect fauna, with a large proportion of endemic species. In the order of 280 invertebrate species have been recorded in the vicinity of the Rössing mine from surveys undertaken in 1984 and 1985. New species have been described from these collections and some specimens await description.

Four distinctive habitat types can be identified and are briefly described as follows:

### **Undulating granite hills**

The granite hills are characterised by gentle slopes with large areas of surface quartz gravel. Plant cover in this habitat is patchy, although most slopes support a few widely spaced individual shrubs. After rains, these hills become almost continuously covered with annual grasses. The habitat supports a relatively diverse arid plant community, with several species of conservation importance, including, *Aloe asperifolia*, *Euphorbia gariepina*, *Adenolobus pechuelii*, *Commiphora saxicola*, *Sarcocaulon marlothii*, *Zygophyllum cylindrifolium* and *Zygophyllum stapffi*. Of particular importance are the *Lithops ruschiorum*, which should be more widely distributed but have come under pressure from illegal plant collecting and are now classified as vulnerable according to IUCN criteria.

### **Drainage lines**

The larger drainage lines running through the site are aligned and drain in a north east to south west direction. Larger drainage lines form wide, open valleys and floors lined with coarse, mostly granite derived sands. Although there is rarely surface water in the river systems there remains an appreciable sub-surface flow that is able to support riparian vegetation. Summer rainfalls on the interior plateau region provide a major source of water to the riverine vegetation and seasonal variations in vegetation are largely related to the frequency, intensity and duration of river flows. Most of the species located in the granite hills also occur within the drainage lines, as well as protected tree species such as *Acacia erioloba* and *Parkinsonia africana*.

### **Quartz outcrops**

Small quartz outcrops occur throughout the site, usually emerging on hilltops. This habitat often supports a greater number of species than the surrounding area, and often a species assemblage of greater conservation importance, including the *Aloe asperifolia*, *Adenia perchuelii*, *Euphorbia gariepina* and *Lithops ruschiorum*.

### **Marble-quartzite ridges**

The marble-quartzite ridges, running predominantly in a north east to south west direction are comprised of dark, exposed quartzite rock and loose quartzite gravel on the surface. This habitat type, after good rains, has continuous annual grass cover and a widely spaced perennial shrub component, which has lower species diversity than the surrounding granite hills habitat type. Many of the shrubs found in the granite hills habitat type also occur here and the noteworthy species include the *Aloe asperifolia*, *Adenolobus pechuelii*, *Aizoanthemum*

*membrumconnectens*, *Commiphora virgata*, *Sarcocaulon marlothii*, *Zygophyllum cylindrifolium* and *Zygophyllum stapffi*.

## 5.4 NATURAL RESOURCES AND RESOURCE USE

### 5.4.1 Water

Water in the Central Namib area is primarily sourced from two large alluvial aquifers, namely, the west flowing Kuiseb and Omaruru Rivers, which by Namwater’s calculations can sustain a supply 15.05 Mm<sup>3</sup> per annum. Namwater operates large wellfields in the Kuiseb and Omaruru deltas and supplies Swakopmund, Walvis Bay, Henties Bay, Arandis, small scale Swakop River farmers as well as the three large industrial users, Walvis Bay Port Authority, and the Langer Heinrich and Rössing mines. The Omdel water supply scheme in the Omaruru River Delta currently supplies 68% of its water to the towns of Henties Bay, Swakopmund and Arandis and a further 28% is utilised by the Rössing.

The Khan and Swakop Rivers have previously been used for water supply, but high salinity levels render the water unsuitable for human consumption and expensive to treat. Rössing mine abstracts water from the Khan River for use as industrial water. These abstractions, in 2003, accounted for 8% of the total water usage at Rössing mine. Under a Department of Water Affairs abstraction license, Rössing mine may abstract a maximum volume of 0.87 Mm<sup>3</sup> per annum, reduced to 0.6 Mm<sup>3</sup> per annum in 1995 due to poor rains, provided that water level drawdown does not exceed 15m below the surface and that vegetation monitoring occurs on a

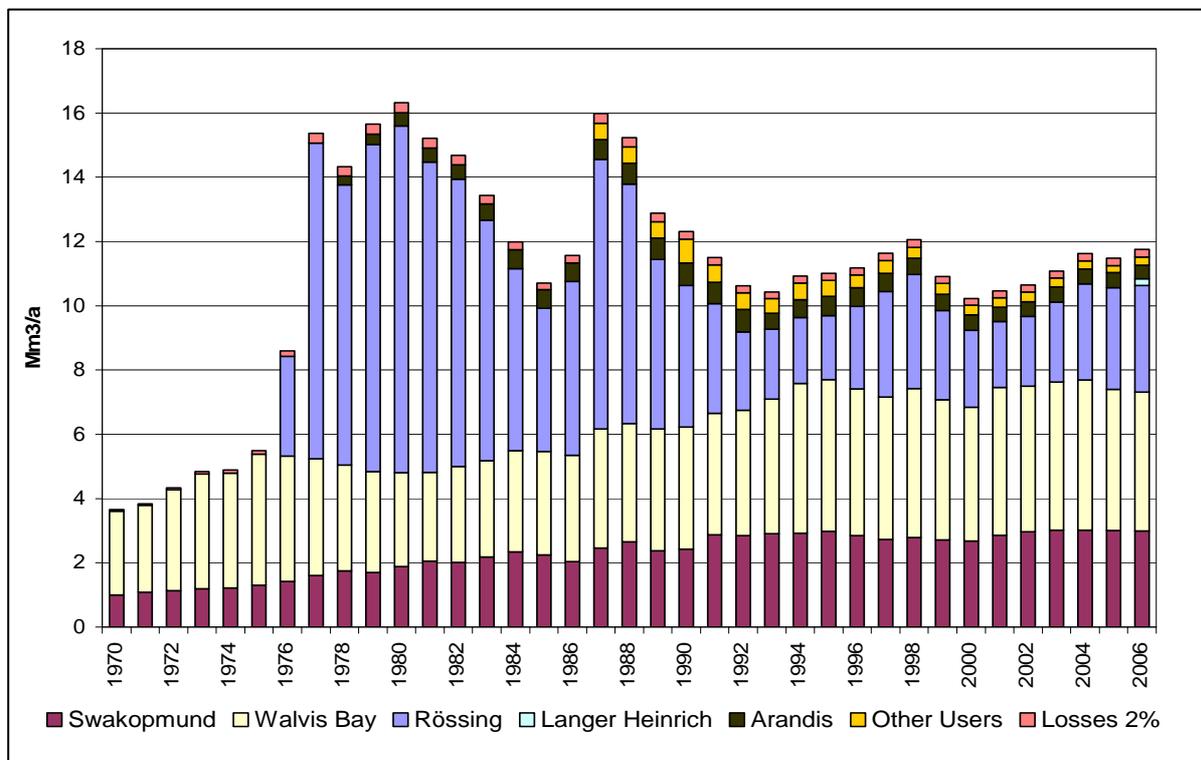


Figure 22: Historical use of freshwater from the Kuiseb and Omaruru aquifers since 1970 (Rössing Uranium Mine. 2007)

regular basis. In compliance with this requirement, Rössing mine undertakes a biannual survey of the Khan River riparian vegetation by assessing the vitality, growth rate, productivity and decay together with the sub-surface water levels to assist in the sustainable management of this resource. The last significant recharge of the Khan River aquifer occurred in 2000 and as a result of this and the findings of the monitoring program, Rössing mine reduced annual abstraction volumes to approximately 0.25 Mm<sup>3</sup>. Abstraction from the Khan River is currently occurring at a rate of 0.25-0.28 Mm<sup>3</sup>/a. In 2006 it was calculated that between 60% and 70% of fresh water utilised at Rössing was recycled and Rössing is targeted to reduce its water consumption per tonne of U<sub>3</sub>O<sub>8</sub> by 10% over that recorded for 2003. Whilst these targets were met for 2004 and 2005, 2006 saw an increase in water consumption to 77 m<sup>3</sup> per tonne of U<sub>3</sub>O<sub>8</sub> produced above the 2006 target when Uranium production was accelerated. New water saving initiatives are planned to ensure future targets are consistently met by 2008.

Rössing has a ground water pollution control system in place, whereby potentially polluted ground water is abstracted and recycled, and to monitor this, Rössing undertakes annual ground water quality monitoring of between 80 and 120 of its boreholes per year, around the mining site, and reports the findings directly the Department of Water Affairs, who monitor compliance with the permit conditions.

#### 5.4.2 Alluvial Sand

Alluvial sand deposits in the gorges vary in thickness up to about 8 m and up to 20 m in the Khan River bed. Alluvial sand has been mined from the dry river beds to the north of the Khan River and used for various purposes at Rössing mine, including rehabilitation, building material and road material. The open pit requires large quantities of sand for the surfacing of haul roads, ramps and waste rock disposal areas. Since 2003 RUL has mined an average of 133 000 tonnes of sand per year. In an effort to conserve the alluvial sand resource, mining of alluvial sand for road dressing material ceased in early 2007 and material for this purpose is currently obtained from the tailings facility.

#### 5.4.3 Energy

In 2005 Rössing mine consumed approximately 30 MW of electricity, which was about 3% of Namibia's installed capacity. At that point, approximately 60% of Namibia's energy is supplied via the Southern African Power Pool (SAPP) with largest generation contributor being the South African-based Eskom. The national grid is also supplied by a number of Namibian-based facilities, including, Ruacana Hydro-electric Scheme (249 MW), Van Eck coal fired power station in Windhoek (120 MW) and the Walvis Bay coal fired power plant (24 MW).

In 2003 Eskom was already experiencing capacity problems in meeting South Africa's peak electricity demands and the Nampower is thus investigating alternative power generation and supply sources to meet Namibia's growing domestic and industrial demand.

More recently, Rössing started to express energy consumption in megajoules per tonne (MJ/t) of ore processed, which is the combined energy usage incorporating electricity and fuels per tonne of ore processed, allowing for the measurement of total energy efficiency. Rio Tinto has

set a target to improve energy efficiency by 5% in 2008 from that expended per tonne in 2003. Due to activities associated with mine extension in 2006, RUL exceeded its target of 91 MJ/t when they realised an energy consumption rate of 113.6 MJ/t.

## 6 IDENTIFIED IMPACTS

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The components of Phase 1 of RUL's proposed expansion project are anticipated to impact on a range of biophysical and socio-economic aspects of the environment. One of the main purposes of the SEIA process is to understand the significance of these potential impacts and to determine if project alternatives are available that are more beneficial to the socio-economic and biophysical environment, or if the impacts can be minimised or mitigated to an acceptable level. This section of the Scoping Report identifies the full range of potential impacts and proposes which impacts should be considered in detail in the SEIA stage to follow. It should be noted that the identification of the impacts described in Sections 6.3 and 6.4 below have been derived from concerns raised during the public participation undertaken to date, as well as input from the project team and responsible RUL personnel. Section 3.1 above describes the most noteworthy issues raised by I&APs in particular.

### 6.1 CONSTRUCTION PHASE IMPACTS

These are impacts on the socio-economic and biophysical environment that would occur during the construction phases of the proposed acid plant, ore sorter and SK4 mine. They are inherently temporary in duration, but may have longer-lasting effects, e.g. the contamination of groundwater during construction could have effects that may last long after the construction phases are complete. Construction phase impacts could potentially include:

- Disturbance of biodiversity resources;
- Impacts on heritage sites;
- Impacts on water resources, namely groundwater occurrences;
- Socio-economic impacts, e.g. temporary housing, in-migration of work seekers;
- Management of materials required for construction or establishment;
- Increase in traffic volumes to the mine and in the vicinity of the construction sites;
- Windblown dust and concomitant release of radioactive materials from exposed substrate;
- Noise pollution and vibration; and
- Pollution from waste and other contaminants.

Based on the temporary duration of the construction phases and the fact that negative impacts of construction can generally be reliably predicted and mitigated, more attention will be given to the operational phase impacts of the proposed Phase 1 components than to the construction phase impacts. This is certainly the case in this instance as, for example, construction phase impacts related to the extension of the ore sorting plant and construction of the new acid plant are regarded as low. These construction related impacts can easily be accommodated within a generic Social and Environmental Management Plan (SEMP) and RUL's own best practice.

However, wherever relevant, specialist studies would consider construction phase impacts, and in certain cases, would be focussed on construction phase impacts e.g. impacts on biodiversity resources are mainly construction phase impacts.

It should be noted that a comprehensive construction phase SEMP will be developed and implemented to regulate and minimise the impacts during the construction phase. This construction specification SEMP will be developed as part of the SEIA Report phase.

## 6.2 OPERATIONAL PHASE IMPACTS

Given their long term nature, operational phase impacts will come under close scrutiny in the SEIA stage of this assessment process, effectively prompted by this Scoping Report. The specialist studies will identify and assess the implications of these impacts and include measure to minimise predicted impacts. The assessment of potential impacts will help to inform RUL's selection of preferred alternatives or to confirm that the best available technologies have been identified and selected, and for these to be submitted to MET:DEA for their clearance. In turn, MET:DEA's decision on the environmental acceptability of the proposed project and the setting of any conditions will be informed by the assessment of alternatives and selection of technologies, together with the specialist studies, amongst other informants, to be contained in the SEIA Report.

It is normal practice that, should the proposed Phase 1 expansion be authorised, the development and implementation of an operational SEMP would be required. The operational SEMP is designed to mitigate negative impacts associated with the operational phase of the project and will be informed by the mitigation measures that emerge from the SEIA process.

## 6.3 SOCIO-ECONOMIC IMPACTS COMMON TO ALL THE PROJECT COMPONENTS

The identified impacts to be assessed during the SEIA process, that relate to the social and economic implications common to the construction and operation of the acid plant and associated infrastructure, the ore sorter and the mining of the SK4 ore body, are as follows:

- The extent of employment opportunities created as a consequence of the proposed developments, both for permanent and contracted workers;
- The occupational health and safety of workers, both permanent and contracted, including air pollution (emissions, dust, radioactivity), and noise;
- The public health and safety of surrounding communities and visitors to the area;
- The need for housing for temporary construction workers, i.e. the location and servicing of construction camps;
- The need for housing for the envisaged increase in employee numbers;
- The extent of commercial benefits for the local and regional economies;
- The in-migration of people seeking employment;
- The availability and adequacy of social services such as schools and medical care;

- The availability and adequacy of infrastructure services such as domestic water supply, waste management, electricity supply and transport services;
- The social ills and community health issues that may accompany in-migration of work seekers, the densification of settlements and unfulfilled expectations; and
- The implications for both local residents and tourists of the possible visibility and noise of the proposed developments.

## 6.4 IDENTIFIED IMPACTS PER PROJECT COMPONENT

### 6.4.1 Acid plant and associated handling, storage and transport

The identified impacts related to the following acid plant and associated sulphur handling, storage and transport activities will be assessed during the SEIA process:

- The offloading of sulphur from ship in the Port of Walvis Bay;
- The location, engineering design, construction, operation and decommissioning of the bulk sulphur storage facility to be installed in the Port of Walvis Bay, including the occupational and public health and safety implications;
- The means of loading and design of the wagons for the rail transport of sulphur from the Port of Walvis Bay to the Rössing mine;
- The location, engineering design, construction, operation and decommissioning of the bulk sulphur storage facility to be installed at the Rössing mine, including the occupational and public health and safety implications;
- The location, engineering design, construction, operation and decommissioning of the acid plant and associated infrastructure (pipework, storage tanks etc) to be installed at the Rössing mine;
- The operational implications of managing the occupational health of personnel and the proper handling of materials required for the running of the acid plant and associated infrastructure;
- A review of the preferred site and associated infrastructure (pipework, storage tanks etc) for the acid plant at the Rössing mine, relative to occupational and public health and safety implications;
- A review of the preferred site and associated infrastructure (pipework, storage tanks etc) for the acid plant at the Rössing mine, relative to visual impact, episodic flood impact and the seismic consequences of blasting operations;
- A review of the energy balance resultant from the operation of an acid plant at the Rössing mine;
- A quantification of air emissions and consequent occupational and public health and safety implications resultant from the operation of an acid plant at the Rössing mine;
- A review of the management and disposal of toxic and other waste generated by the operation of an acid plant and associated infrastructure at the Rössing mine; and
- A review of projected water consumption and management.

### 6.4.2 Radiometric ore sorter plant and associated reject rock disposal

The following identified impacts related to the ore sorter and reject rock disposal sites will be assessed during the SEIA process:

- A review and assessment of the scope and findings of the environmental assessment undertaken for the radiometric ore sorter plant during 2005.
- An assessment of the projected volume of reject rock material to be disposed of during the extended life of the mine insofar disposal options are concerned. (Besides the seven sites identified and assessed during the earlier study, the possibility of utilising existing, designated waste rock disposal areas is being kept as an option. An engineering cost study is also underway to determine the most beneficial means of transporting the reject rock, i.e. whether by truck or conveyor, and the findings of this study will provide an important informant in the finalisation of feasible disposal site alternatives. Once feasible disposal site alternatives are available, the mine's land use plan regarding location and spatial extent will provide a point of departure for the SEIA stage.);
- An assessment of the potential impacts on the biophysical environment of reject rock disposal site alternatives;
- An assessment of the potential impacts on occupational and public health and safety of reject rock disposal site alternatives;
- An assessment of the visual implications of reject rock disposal site alternatives;
- An assessment of the biodiversity implications of reject rock disposal site alternatives;
- A review of the preferred site, ore sorter design and associated infrastructure (conveyors, pre-screening units etc) for the sorter plant relative to episodic flood impact and the seismic consequences of blasting operations;
- A review of the preferred site, ore sorter design and associated infrastructure (conveyors, pre-screening units etc) for the sorter plant relative to occupational and public health and safety;
- A review of the energy balance resultant from the operation of the ore sorter and associated infrastructure (conveyors, pre-screening units etc); and
- An assessment of vibration resultant from the proposed pre-screening units (cf. present extreme vibration from the existing pilot ore sorter plant).

### 6.4.3 Mining of the SK4 ore body

The following identified impacts related to the mining of the SK4 ore body will be assessed during the SEIA process:

- A review and assessment of the scope and findings of the draft Environmental Management Plan for the extension of mining activities into SK4 undertaken during 2007 (unpublished);
- An assessment of the biodiversity impacts resultant from mining the SK4 ore body;

- A review of the impacts of blasting, noise and vibration resultant from mining the SK4 ore body;
- A review and assessment of the engineering design (alignment and geometry) of the haul road proposed for the SK4 pit, as well as other service infrastructure such as water and electricity supply;
- A review of the projected volume of waste rock to be disposed of during the extended life of the mine insofar disposal options are concerned. (Although disposal site *Waste 7* has been identified for such disposal, longer term implications will be assessed. The mine plan would provide a point of departure in this regard.);
- An assessment of the potential impacts on occupational and public health and safety resultant from mining the SK4 ore body (cf. dust, radiation and noise);
- An assessment of the visual implications resultant from mining the SK4 ore body;
- A review and assessment of the supply, storage, application, runoff and reuse of water necessitated by the mining of the SK4 ore body; and
- A review of the energy balance resultant from mining the SK4 ore body (cf. drilling, blasting, loading and hauling activities).

## 6.5 SPECIALIST STUDIES

As required by the Request for Proposals put out by RUL when embarking on the SEIA process, Ninham Shand formed a team with a suite of specialist consultants in various disciplines<sup>19</sup>. As part of the scoping exercise, the team of specialists attended a site visit and workshop to determine if, on the basis of available information and the site inspection, the scope of their work as originally envisaged was appropriate or whether their Terms of Reference needed to be amended. The outcome of the workshop was that, while some impacts might have been considered to be relatively benign, best practice and a need to fully understand the implications of the proposed project warranted that further investigation of all identified issues be undertaken.

A description of the proposed specialist studies follows and the Terms of Reference for each is also provided. This allows the public the opportunity to comment on, and the authorities to approve of, the proposed approach to the SEIA stage. Assurance is thus provided that the work undertaken addresses the issues of concern at the requisite level of confidence and that a robust basis for informed debate and decision-making is provided.

Accordingly, the following specialist studies by the relevant specialists are proposed to be undertaken in the SEIA stage to follow:

### 6.5.1 Socio-economic impact assessment

The socio-economic implications of RUL's proposed Phase 1 expansion project will be assessed by Marie Hoadley, an independent social impact consultant. The scope of her specialist study is as follows:

<sup>19</sup> Note however that RUL has directly commissioned certain of the specialist studies, as described in Section 1.7 and further reflected in this section.

This study, to include both construction phase and operational phase socio-economic impacts, will investigate and describe the national, regional and local socio-economic conditions before investigating and describing the direct, indirect and cumulative social and economic impacts of the components of the proposed expansion project presently being investigated.

Specific activities to be attended to during the study are to:

- undertake a desktop study of current literature on social impact assessments, Namibian legislation and policy, the development environment in Namibia and existing information on the communities of interest;
- establish broad baselines of the receiving socio-economic environments;
- undertake wide, inclusive, transparent and ongoing public participation and consultation;
- assess the identified impacts;
- develop a management framework to address negative impacts and optimise benefits; and
- liaise with the other SEIA specialists so as to supplement the socio-economic study with information from their areas of expertise and to ensure integration of socio-economic issues into the overall SEIA Report.

The study complies with Namibian legislative and policy requirements and the Rio Tinto standards, guidelines and guidance documents as these relate to the socio-economic and community components of the project.

The socio-economic study will address:

- socio-economic aspects, including employment, training, housing, inward migration, the potential for increased social ills, demands on, and capacity of local services, and cumulative effects;
- environmentally induced socio-economic impacts, including land-use, water quantity and quality, local concerns and perceptions of environmental impacts, and cumulative effects; and
- mitigation measures to address identified impacts and measures to optimize benefits.

### 6.5.2 Air quality specialist study

The air quality specialist study will be undertaken by Airshed Planning Professionals and the scope of their study is as follows:

As a **baseline assessment**, a general description of the climate for the greater region would be determined from the existing monitoring data and historical records. Meteorological mechanisms govern the dispersion, transformation, and eventual removal of pollutants from the atmosphere. All available local meteorological data will be analysed and where necessary, missing data inter- and extrapolated. For the purposes of establishing the local climatology, it is a necessity to analyse at least one year's data. However, a normal requirement is for a five-year database. An analysis of the data would serve to:

- Provide a general description of the local climate;
- Calculate fugitive airborne dust emissions; and,
- Be used in the dispersion simulations.

Hourly average meteorological data will be utilised, including wind speed, wind direction and temperature. Mixing heights will be estimated for each hour, based on prognostic equations, while night-time boundary layers will be calculated from various diagnostic approaches. Wind speed and solar radiation are used to calculate hourly stability classes. The analysis of meteorological data will include diurnal temperature profiles, wind roses, atmospheric stability classifications and inversion height estimations.

Air quality data will be analysed in comparison to both local and international guidelines and standards. The USA Environmental Protection Agency, the European Union and the World Health Organisation are normally cited.

An **impact prediction study** will follow, as now described.

The modelling scope includes the dispersion of air pollutants arising from all potential sources at the proposed pit, ore sorter and acid plant. When addressing airborne pollutants, both routine and upset emissions will be included.

Stack emissions are relatively well-defined. The quantification of fugitive dust emissions from mining operations on the other hand always requires use of past experience, and the availability of emission factors. The most readily available emission factors are those published by the USA Environmental Protection Agency.

The parameters important in estimating fugitive dust emission rates from mining operations include:

- Overburden handling;
- Topsoil removal;
- Movement of mining equipment;
- Operating procedures;
- Terrain;
- Vegetation;
- Precipitation and surface moisture; and
- Wind speeds.

Emission factors for typical mining operations have been used successfully in the past. These factors and equations include:

- Vehicle traffic;
- Storage piles; and
- Dust emissions generated by wind erosion of exposed areas.

Ground level concentrations of pollutants for all these sources (Mining operations, ore sorter and acid plant) will be performed. Dispersion models compute ambient concentrations as a function

of source configurations, emission strengths and meteorological characteristics, thus providing a useful tool to ascertain the spatial and temporal patterns in the ground level concentrations arising from the emissions from various sources.

All emission scenarios will be simulated using one of the following models:

- ADMS 3 (UK);
- USA Environmental Protection Agency's Industrial Source Complex model (version 3), and in particular the short term component (ISCST3); or
- The US Environmental Protection Agency's AERMOD model.

The model selection will be based on the complexity of the terrain and the availability of detailed meteorological data. The AERMOD models require upper air data, which is not always readily available. Alternatives are to use simulated data such as the global ETA model.

The **project deliverables** for the air quality study will comprise:

- A summary of meteorological parameters;
- Model input data preparation and assumptions;
- A description and quantification of the sources of pollution;
- Isopleth plots of ground level concentrations;
- Health risk assessment (non-radioactive) and a comparison to Local and International guideline values and standards; and
- Comprehensive assessment report comprising assumptions made, methodology used, results produced and impacts predicted.

### 6.5.3 Quantitative risk assessment

The quantitative risk assessment will be undertaken by RisCom and the scope of their study is as follows:

- To develop accidental release and fire scenarios for the proposed sulphuric acid plant and the handling, storage and transport of elemental sulphur feedstock via the Port of Walvis Bay and on the mine site. The potential risks during the start-up of the plant from cold will be included as a scenario.
- Using generic failure rate data (tanks, pumps, valves, flanges, pipe work, gantry, couplings, etc) to determine the probability of each accident scenario.
- For each incident developed in the previous step, determine the consequences (toxic end points, thermal radiation, domino effect, etc).
- Calculate Maximum Individual Risk values taking into account all accidents, meteorological conditions and lethality.

This information will then be used to identify any shortcomings and rank the risks for possible risk reduction programmes.

The results of the assessments will be tabled in a document addressing some or all of the topics listed in the Major Hazard Installation regulations derived from the South African Occupational Health and Safety Act (No. 85 of 1993). It should be noted that the risk assessment will not

constitute an environmental risk assessment, i.e. it will be confined to risks to human health and not to possible biophysical impacts. The risk assessment will exclude natural events such as earthquakes and floods.

#### 6.5.4 Visual impact assessment

The visual impact assessment will be undertaken by Visual Resource Management Africa (VRMA) and the scope of their study is as follows:

VRMA uses the *VRM methodology* developed by the *Bureau of Land Management (BLM) from the United States Department of Internal Affairs* to measure contrast in order to analyse potential visual impacts associated with projects and activities. The basic philosophy underlying the system is that the degree to which a management activity affects the visual quality of a landscape depends on the visual contrast created between a project and the existing landscape. The VRM study consists of the following stages:

##### Visual inventory

Different levels of scenic value require different levels of management, involving the identification of the visual relationships which exist between the existing landscape, the proposed landscape modifications and the people (receptors) in the area. This requires the following studies:

- A site visit to create a photographic assessment of the current landscape character of the sit and region;
- A viewshed analysis to determine the extent to which the proposed modifications (and alternatives) would be visible to the surrounding areas; and
- A visual inventory to map and quantify the visual significance of the area where the proposed modification is to take place and defines Visual Resource Management Objectives for the area.

##### Contrast rating

The analysis stage involves determining whether the potential visual impacts from proposed modifications would meet the management objectives established for the area, or whether design adjustments will be required. The steps in the Contrast Rating Process are:

- Obtaining a detailed project description; and
- Measuring the Degree of Contrast that the proposed modifications would create from each of the identified key observation points.

##### Impact assessment

Impacts will be defined for all the proposed landscape modifications and the defined alternatives based on the following criteria:

- Distribution of impacts: Advantages and disadvantages;
- Extent: The spatial or geographic area of influence of the visual impact;
- Duration: The predicted life-span of the visual impact;

- Intensity: The magnitude of the impact on views, scenic or cultural resources;
- Probability: The degree of possibility of the landscape modification occurring; and
- Significance: A synthesis of the above.

### Management actions

The following criteria will be utilized to formulate management actions:

- Avoidance;
- Mitigation;
- Compensation and offsets;
- Rehabilitation and restoration; and
- Enhancement.

### 6.5.5 Radioactivity and public dose assessment

This potential impact will be assessed by means of collating available information and extrapolating predicted dispersion of radioactive material by means of modelling. The acceptability of the findings derived in this way will be confirmed by the Nuclear Energy Council of South Africa (NECSA). Professor De Beer of NECSA will be undertaking this work.

The public dose assessment will be informed by modelling of emissions through the atmospheric pathways and by modelling of potential exposures through the aquatic pathway.

The scope of work is as follows:

Public exposure will be considered at a number of receptor locations through the atmospheric pathway (radioactive dust and radon). The future scenario to be assessed is the operational phase of RUL's maximum expansion scenario taking all developments foreseen in this expansion process into account.

The purpose is to determine whether a maximum expansion will increase public exposure of the critical population at Arandis above the dose constraint. Should this be the case, development may need to be managed in such a way that prevention or mitigation of exposures above the dose constraint is achieved. It is assumed that post-closure exposures caused by the maximum expansion will be equal to or lower than the exposure in the operational phase and therefore not need to be specifically assessed in this phase.

The dose constraint to be used is 300 mSv/a millisieverts per year. A probabilistic assessment will be carried out and the significance of the change in exposure caused by the additional dose compared to the background dose will be determined. A sensitivity analysis will be carried out in order to understand which potential mitigation actions would result in the most significant dose reduction.

The receptor locations to be assessed are:

- The location of the new acid plant within the current industrial complex of Rössing mine;
- E Camp, which is an office and visitors centre just outside the mine;
- The Arandis Airport;
- Khan Mine;
- Arandis town, considering town extension towards the main road and therefore the tailings dam;
- Goanikontes in the Swakop River;
- Trekkopje exploration camp site;
- Valencia exploration camp site;
- The Langer Heinrich Uranium mine;
- The farming community outside Swakopmund;
- The town of Swakopmund.

In order for the results to be incorporated into mine planning and for the work to be reviewed by independent third parties, the following deliverables will be provided:

- Assessment report including sensitivity analyses and sufficient illustrations for the reviewers to understand the input parameters and sources for the model. The report will contain appendices with tables of all data used.
- A set of digital maps showing receptor locations, source geometry and isodose contours for the maximum expansion scenario on the locally used survey grid system (LO15).

### 6.5.6 Biodiversity assessment

The biodiversity assessment will be undertaken by the Desert Research Foundation of Namibia (DRFN) and the scope of their study is as follows:

To identify sensitive areas and apply a system of biodiversity quantification that includes the level of endemism of species and their conservation status. The 'father company' of RUL, Rio Tinto, intends to use RUL as a pilot site for its biodiversity strategy to identify sensitive areas.

This project will build on plant biodiversity work which has already been conducted in the area by Dr Antje Burke, as well as animal biodiversity work conducted in the mid 1980s by staff of the State Museum. Activities that would need to be carried out are now described.

### Status, distributional and ecological information

Status, distributional and ecological information pertaining to the known animal site endemics will be ascertained and compiled into a format appropriate to the SEIA's needs. Follow-ups of the 1980s work has already been initiated by Dr John Irish and will be brought to a conclusion.

## Identification of species

All species in all taxonomic groups will be identified and listed, and their known distributions mapped in relation to the intended areas of expansion. They will all be ranked according to the criteria of vulnerability and irreplaceability, to identify those that have high conservation priority.

## Field surveys

Field surveys of the biological soil crusts and lichens, invertebrate pit-trapping and collecting surveys and small vertebrate censuses will be conducted over the area, to obtain information pertaining to the distribution and occurrence of the prioritised species. Habitats shown to host high-priority species will be identified, described and mapped, both within the area of mine expansion and the neighbouring areas. Once the high-priority habitats are recognisable in terms of topography, vegetation and other features, it will be possible to check outlying areas for the occurrence of similar habitats.

## Database input

Information from the field surveys will be fed in to the growing database, thereby gradually building up a model of conservation priority of the different habitats, and the spatial occurrence of the various habitats known to host high-priority species. Likewise, information from a botanical survey previously conducted by Antje Burke will be fed into the database.

## Compilation of maps and reports and the presentation thereof

Compile multi-layered maps and reports that will be easily interpreted by the SEIA project team and RUL, and make oral presentations on the conclusions and recommendations of the study. Information collected in the entire exercise will serve as a useful baseline for future monitoring of occurrence and abundance of high-priority species.

### 6.5.7 Archaeology (i.e. heritage)

A heritage survey was undertaken during 2006 for the entire RUL mine licence area, and again during 2007 when the focus was on the areas of the proposed SH and SK pits.

A consequence of these studies was the issuing of permits for the exploration phase of the expansion project. Their renewal and amendment will be undertaken as part of the SEIA process by Dr Kinahan, an independent contract archaeologist trading as Quaternary Research Services.

The scope of the 2006 survey was as follows:

- Desk assessment based on existing data from the RUL licence area and related records;
- Design of field survey based on desk assessment and orthophotography of survey area;
- Systematic field survey with full documentation of all heritage related occurrences;

- Estimation of previous impacts based on survey results projected to disturbed ground;
- Assessment of significance and vulnerability based on standard rating criteria; and
- Heritage conservation and impact mitigation programme for implementation.

### **Field survey**

The field survey consisted of a detailed documentary and photographic record of all heritage related occurrences within sample areas selected for examination. The intensity of field survey (i.e. percentage cover) was determined by a desk assessment and involved a statistical weighting of types of terrain that usually yield archaeological remains. In the case of the RUL licence area, which has a long history of mining activity, the survey made use of bi-temporal pairs of aerial photography (e.g. 1972 and 1998) to estimate the scale of impacts prior to the proposed survey. Actual observations (from the field survey) and inferred occurrences (based on the aerial photography) were integrated within a GIS project framework, with all field survey records in digital format.

### **Assessment**

Heritage related occurrences (palaeontological, archaeological and historical finds) were assessed according to their significance and their vulnerability to impacts. Significance was estimated on a scale of 0 – 5, according to the value of a particular site or object to the cultural history of the property and the surrounding region. The significance rating is also affected by the state of preservation and the degree of previous impact. Vulnerability was estimated on a parallel scale of 0 – 5, according to the exposure of the site or object to future impact. The two scales allow value and risk to be independently assessed.

### **Conservation**

In a controlled environment such as the RUL licence area it is possible to limit unintended impacts by imposing buffer zones with corresponding signage or barriers on the ground. Unavoidable impacts need to be mitigated by means of excavation, surface collection or other procedures to rescue materials and information that would otherwise be lost. Integration of the heritage survey GIS with the mine environmental management system will reduce or eliminate inadvertent impacts.

The scope of the additional work carried out earlier this year was to undertake a field survey of the SK area that entailed a detailed examination of the designated area and the location and evaluation all heritage sites. The sites were documented in the same way as the sites covered by the general survey of RUL's mining licence area. A separate report was compiled on the SK area with detailed proposals for mitigation of impacts.

### 6.5.8 Water resources management assessment

The water resources management assessment will be undertaken by Ms Sandra Müller of RUL and the scope of her study is as follows:

The objective of the study is to assess the impact of RUL's Phase 1 mine expansion projects on water management aspects, especially water use, runoff and groundwater quality.

#### Freshwater consumption

The acid plant will consume approximately 1000 m<sup>3</sup>/day of fresh water at full production. The ore sorter will need water for dust suspension and the required volume must be determined in co-operation with the engineering consultant.

Increased mining activity in the SJ open pit will increase the demand for dust suppression water from the current level of 700 m<sup>3</sup>/day to 1300-1500 m<sup>3</sup>/day. An engineering project is in progress to supply recycled water from the seepage control system to the open pit. This will create a shortfall in seepage supply to the processing plant that has to be made up by adding 0.26 Mm<sup>3</sup>/a of fresh water. The background of the project will be described in some detail to dispel stakeholders' fears that RUL might increase abstraction from the Khan River.

The expected total increase in freshwater consumption of around 2000m<sup>3</sup>/day will raise the mine's annual water demand from 3.3 to 4.0 Mm<sup>3</sup>. The increase is within the maximum of 4.5 Mm<sup>3</sup>/annum provided for in the current water supply contract with NamWater. The impact of the increased abstraction on the coastal aquifers and other water users will be described in the report. The existing Rössing Water Management Plan, which describes the current status of the aquifers, will supply the required baseline information.

#### Effluent and runoff

The potential for contaminated runoff and effluent generation will be investigated for each project. The acid plant is located close enough to the processing plant to channel acidic effluent into the Plant Spillage Sump. The ore sorter and SK4 areas will generate waste rock, which may form leachates containing sulfate, nitrate and uranium after intense rainfall of more than approximately 20 mm per event. RUL will carry out geochemical characterisation studies according to procedures recommended by Rio Tinto experts. The determination of acid rock drainage potential will form part of these tests. The results will however not be available in time for the Phase 1 SEIA report. The results of preliminary leach tests carried out on SJ waste rock and ore will be used in the meantime to indicate the magnitude of potential impacts on groundwater quality.

#### Hydrogeological investigation

A comprehensive hydrogeological study consisting of geophysical borehole siting, drilling of monitoring boreholes, yield testing, water quality sampling and 3D flow modelling will be carried out as part of the SEIA. Most of the results will only be available for the Phase 2 SEIA. For

Phase 1 a report will be produced that focuses on the SK4 pit and its hydrological impact, taking into account all the new information that will become available before the report deadline.

The company Bittner Water Consult (BIWAC) will evaluate the geological structure of an area covering the Rössing Dome, identify suitable sites for monitoring boreholes, arrange a drilling contractor and supervise the drilling project. The borehole data will provide baseline water quality data for the area potentially affected by mine expansion projects. The hydrogeological parameters and water levels will be used as input for an extension to the existing 3D flow model of the mine site.

Aquaterra will extend the hydrogeological flow model and simulate the impact of the new open pits on the water table. The output of this model will later be used to set up a geochemical transport model that will identify contamination flow paths, velocities and allow for the effective design of the control measures.

The results of the hydrogeological investigation will be summarised in a report that will form part of Phase 2 SEIA.

## Report outline

The table of contents for the Phase 1 SEIA water management report is as follows:

- Impact of the acid plant, ore sorter and SK4 pit on freshwater consumption;
- Impact of increased water demand on coastal aquifers;
- Impact of the acid plant on runoff and effluent generation;
- Impact of the ore sorter on runoff and surface water quality;
- Impact of the ore sorter on runoff and water quality;
- Impact of the SK4 pit on surface water runoff and quality; and
- Impact of the SK4 pit on groundwater quality.

### 6.5.9 Noise and vibration

A noise and vibration study will be undertaken by Namibian Vibration Consultants (NVC) during the SEIA stage of the present process. The findings of such a study are unlikely to be detrimental to decision-making, since these impacts are well understood on Rössing mine and have been monitored and managed for a considerable period of time. The outcomes of the envisaged noise and vibration study will certainly result in continued and enhanced application of RUL's occupational health and safety procedures.

The noise and vibration study is intended to identify noise and vibration sources, evaluate and prioritise the sources according to significance of potential impacts and then recommended effective measures to design and implement appropriate control and mitigation measures. The scope of work will include:

**Establish RUL's baseline noise and vibration levels** (including blast noise and vibration) as well as background noise and vibration levels for existing operations. The baseline noise and vibration study will be based on noise measurements in accordance with the SANS 10103: 2004

and SANS 10328:2001, or equivalent National or International Standards. The study will determine the existing levels within and around the proposed mine areas, as well as selected positions within any noise and vibration exposed community.

Identify which components of the facility and activities are the key contributors to external noise and vibration levels. Conduct a risk assessment to identify whether management controls and/or ongoing monitoring/modelling are required to address significant risks.

An **inventory** of all identifiable noisy and/or vibrating equipment and machinery on the mine will set up and its noise and/or vibration output will be measured using a standardised method. This task must cover both existing stationary and mobile equipment and sufficient samples to provide a reliable value where items are duplicated.

A **qualitative assessment** will be made of the effect of vibration from blasting and in-pit mechanical activities. This task will include blast and ground vibration measurements at the site boundaries and/or sensitive receivers remote from the pit as are possible.

The analysis of the data produced will be utilised to produce recommendations for control mechanisms suitable for ongoing noise reduction programs to meet regulatory requirements.

**Establish a model** or real time assessment of near and far field noise and vibration levels throughout the life of the operation. Conduct a noise and vibration impact assessment according to applicable standards (SANS 10103:2004, SANS 10328:2006, SANS 11204:1995/ISO 11204:1995 and SANS 13474:2005/ISO/TS 13474:2003). Modelling will, where applicable, incorporate baseline/background data, community expectations, and regulatory requirements and identify significant exposures to sensitive receptors.

Recognised software for predicting noise and vibration contours, for ground noise and vibration sources will be used to enabling different scenarios to be realised and tested to optimise layouts of potentially noisy activities, plant, and equipment, in the area. The model will utilise standard and user-defined profiles, and terrain, as inputs. The profile and calculation algorithms are based on several guidance documents that address atmospheric absorption and noise attenuation. The main outputs from the model will be noise and vibration exposure contours that are used for land use compatibility mappings and impact assessment.

The analysis of the data produced under the baseline study and modelling program will be utilised to undertake a current situation environmental noise and vibration impact assessment. From this a forward looking environmental noise and vibration management plan will be developed.

Based on the outcome of the study, environmental noise and vibration monitoring program, methodology and equipment will be recommended as well as recommendations for monitoring machines' vibration to ensure optimal conditions to avoid noise and vibration emission.

**Occupational hygiene** - RUL has a set noise target to have a 20% reduction in the number of employees/10 000 exposed to noise >85dB (A) without allowance for hearing protection by the end of 2008. To achieve this target further work on specific noise sources needs to be done and will include:

- Identification, assessment and evaluation of all plant and workshop noise sources.
- Recommend appropriate methods of reducing those noise sources contributing most to the daily Leq of the workforce, especially those employed in areas where the area noise level is greater than the statutory limit of 85 dB(A).
- In addition to the measurements performed, measurements specifically related to the occupation noise and vibration targets will be performed in all areas of the plant. This data will then be used in order to identify the major noise and vibration sources and recommend continuous noise and vibration reduction procedures appropriate and therefore feasible in the mine.
- The assessment will include cost and feasibility estimates in order to achieve a 5%, 15%, and 30% reduction in the number of employees subjected to occupational noise/vibration levels above the target.

### 6.5.10 Mineral waste and tailings management

The proposed Phase 1 components of RUL's expansion project will necessitate the revision of existing mineral waste and tailings management. However, these activities are also well understood, due to their having been managed for a considerable period of time. The necessary expertise is available within RUL, as RioTinto Technology and Innovation, to provide the appropriate level of technical input into the SEIA stage of the present process.

The Rio Tinto *Excellence in Mineral Waste Management Program* has been developed to help operations and projects reduce the environmental, health, financial and reputational risks posed by mineral wastes such as tailings, waste rock and open pits. This programme is designed to help reduce the risks posed by reactive mineral wastes by identifying issues of potential concern and developing cost effective and realistic management and control strategies. The program is intended to provide expert technical analysis and guidance outside of the formal corporate assurance framework. It is pertinent to any environmental exposure hazard posed by mineral wastes including but not limited to acid rock drainage (ARD), salinity, contaminants soluble at neutral pH, radionuclides, cyanide, spontaneous combustion and asbestos. The program is focused on environmental management issues rather than geotechnical stability issues, which are addressed by other corporate initiatives.

Mineral waste issues must be successfully managed throughout the exploration, mining and processing cycle, from initial characterisation and realistic costing during project development through to final closure. The key goal for the management of reactive mineral wastes is to ensure that environmental impacts always remain within acceptable limits. Management and control strategies should be designed to meet the limits in a reliable, cost effective manner that meets or exceeds local regulations and permit conditions, and is consistent with the Rio Tinto HSE standards. The *Excellence in Mineral Waste Management Program* assesses the operation's performance against a set of key performance areas and benchmarks. Areas of unacceptable risk or uncertainty will be highlighted, conceptual solutions will be identified and action plans developed through interactive cooperation between site staff and Rio Tinto specialists. On-going technical support will also be provided, as agreed and as required for implementation of the identified solutions. More complex data collection, modelling, analysis and design should only be performed if the key questions cannot be resolved simply.

## Methods

Implementation of the *Excellence in Mineral Waste Management Program* will generally require a site visit lasting approximately five days by a team of two to three mineral waste management specialists. Longer visits and larger teams may be required depending on the agreed scope of the program and for bigger sites where numerous mineral waste management issues are being examined. The review team may include outside technical specialists if needed, but will always be led by personnel from Rio Tinto. The first part of the visit will be taken up with inspections, interviews with key technical and management personnel, and document and data reviews.

These will include:

- Site Baseline Characterisation;
- Stakeholder Requirements and Expectations;
- Waste Material Characterisation;
- Release Mechanisms;
- Migration Pathways and Fluxes;
- Potential Receiving Environments;
- Integrated Conceptual Understanding;
- Development of Receiving Environment and Performance Criteria;
- Materials Management and Control Strategies;
- Monitoring and On-going Assessment; and
- Management Skills and Resources.

Performance in each performance area will be compared to benchmarks that are appropriate to each site's unique geochemical and environmental setting. Issues identified during this assessment will be discussed with key technical personnel at the site and conceptual solutions will be identified during a one to two day workshop. After agreement is reached with senior management on the recommended conceptual solutions, a draft prioritised action plan will be issued to the site for final signing off. The program will aid in implementation of Rio Tinto's Mineral Waste Management Environmental Standard and it will fulfil the requirement for an independent review of the operation's ARD Management Plan as required by the Rio Tinto Acid Rock Drainage Prediction and Control Environmental Standard.

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## 7 CONCLUSION AND RECOMMENDATIONS

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### 7.1 CONCLUSION

This Scoping Report has been informed by the issues and concerns raised by the authorities, the proponent (RUL) and by the project team, as well as the public participation process to date. It has presented the context and rationale for the project, described the project components and screened the suite of possible alternatives, mitigatory actions and environmental implications.

Both the external and internal reviews of a draft version of the present Scoping Report, undertaken by Dr Peter Tarr of the Southern African Institute for Environmental Assessment and Dr Peter Ashton of the CSIR respectively, have indicated that the document meets accepted standards for the scoping stage of environmental impact assessments. However, both reviews are critical of the inaccessibility of the report, insofar the use of technical wording and abstract phrases is concerned. An attempt has been made to address this shortcoming as far as possible. Several other concerns were raised regarding the accuracy and completeness of some of the technical information provided and these have been corrected where appropriate. On balance, we are of the opinion that the present Scoping Report serves its purpose in a satisfactory manner.

### 7.2 RECOMMENDATIONS

In response to the scoping now completed, the following specialist studies will be undertaken:

- Air quality study;
- Quantitative risk assessment;
- Visual impact assessment
- Social impact assessment;
- Radioactivity and public dose assessment;
- Biodiversity;
- Archaeology (i.e. heritage);
- Water resource management;
- Noise and vibration study; and
- Mineral waste and tailings management.

Specifically, the Scoping Report has determined the scope of work and level of details of each of the above investigations.

As discussed in Section 3.3, the following alternatives are proposed to be taken forward to the next stage of the EIA process for detailed assessment:

- Acid plant and related handling, storage and transport of sulphur feedstock:
  - Design of handling and storage facility in Port of Walvis Bay
  - Design of rail wagons required for sulphur transport
  - Stack height of acid plant
- Radiometric ore sorter plant:
  - Vertical or horizontal arrangement of pre-screening units
  - Suitable disposal site for reject rock
- SK4 ore body:
  - Haul road design and alignment
  - Waste disposal
  - Water management

These aspects of the listed Phase 1 SEIA project components will be subjected to the consideration and evaluation of alternatives in the assessment stage of the process. The aspects that do not have alternatives will nevertheless also need to be assessed. This will be done by means of determining that acceptable levels of mitigation are available, or by confirming that the best available environmental design or practice is being applied.

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# ANNEXURE A: GLOSSARY

# ANNEXURE B

## MET:DEA CONFIRMATION OF SUPPORT FOR SEIA PROCESS

# ANNEXURE C

## EXAMPLE OF NEWSPAPER ADVERTISEMENT

# ANNEXURE D

## EXAMPLE OF PUBLIC NOTICES

# ANNEXURE E

## PUBLIC INFORMATION DOCUMENT

# ANNEXURE F

## LIST OF FOCUS GROUP AND KEY INFORMANT MEETINGS

# ANNEXURE G

## FOCUS GROUP AND KEY INFORMANT MEETINGS MINUTES

**ANNEXURE H**  
**STAKEHOLDER FEEDBACK FORMS**  
**Sheets 1 & 2**

# ANNEXURE I

## REGISTER OF INTERESTED AND AFFECTED PARTIES

# REPORT DISTRIBUTION CONTROL-SHEET

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MINE IN NAMIBIA: PHASE 1 ~  
ACID PLANT, ORE SORTER & SK4 PIT**

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