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DRAFT SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT: PROPOSED MINE EXPANSION PROJECT PHASE 2A ~ SULPHUR HANDLING FACILITY IN THE PORT OF WALVIS BAY

November 2009

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CLIENT	Rio Tinto Rössing Uranium Limited
REPORT STATUS	Draft
NS REPORT NUMBER	4873/105551
RELEASE DATE	06 November 2009

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This report is to be referred to in bibliographies as:
Aurecon. 2009. *Social and Environmental Impact Assessment: Proposed Mine Expansion Project Phase 2a ~ Sulphur Handling Facility in the Port of Walvis Bay.* Draft Social and Environmental Impact Assessment Report *(Report No 4873/105551).*

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ACKNOWLEDGEMENTS

The authors would like to express their gratitude to the following Rössing Uranium Uranium and Rio Tinto employees for their co-operation and assistance with the provision of information in the compilation of this report:

Rainer Schneeweiss, Svenja Garrard, Dave Garrard, Reiner Przybylski and Phillip Coetzee.

Abbreviations

° C	Degree Celsius
µm	micrometre
CEO	Contractor's Environmental Officer
cm	Centimetre
dB	Decibel
dB(A)	Ambient decibels
EMS	Environmental Management System
FIFO	First In First Out
GDP	Gross Domestic Product
GHG	Greenhouse gasses
Grindrod	Grindrod Limited (Lessee of NamPort for the Bulk Handling Terminal in the Port of Walvis Bay)
H&E	Health and Environment
H_2S	Hydrogen Sulphide
H_2SO_4	Sulphuric Acid
H_2SO_4	Sulphuric acid
HAZOP	Hazard and Operability
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome
HSE	Health Safety and Environment
HSEQ	Health, Safety, Environment and Quality
I&APs	Interested and Affected Parties
IEA	Independent Environmental Auditor
ISO	International Standards Organisation
km/h	Kilometre per hour
kt	Kilotonne
ℓ	Litre
$L_{Aeq,I}$	Equivalent continuous A-weighted sound pressure level [dB]
LOAELS	Lowest-observed-adverse-effect levels
m	Metre
m^2	Square metre
M^2	Square metres
MET	Ministry of Environment and Tourism (National environmental authority)
MET:DEA	Ministry of Environment and Tourism: Directorate of Environmental Affairs
mg/m^3	Milligrams per cubic meter
mm	Millimetre
MSDS	Material Safety Data Sheet
NamPort	Namibian Port Authority
NOAELS	No-observed-adverse-effect levels
OHS&E	Occupational Health Safety and Environment
OHSA	Occupational Health and Safety Act
OHSEC	Occupational Health, Safety, Environment and Community
PCBs	PolyChlorinated Biphenyls
pH	An expression for the effective concentration of hydrogen ions in solution determining the measure of the acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity
PID	Public Information Document
PM	Project Manager
PMT	Project Management Team
PPE	Personal Protective Equipment
Ramsar	An international convention that affords conservation status to specific wetlands.
REO	Rossing's Envuironmental Officer

Rev	Revision
Rössing Uranium	Rio Tinto Rössing Uranium Limited
S	Sulphur
S&EP	Social and Environmental Policy
SANS	South African National Standards
SEIA	Social and Environmental Impact Assessment
SEMP	Social and Environmental Management Plan
SO_2	Sulphur Dioxide
SO_3	Sulphur Trioxide
t	Tonne
T&I	Technology and Innovation (of Rio Tinto)
TransNamib	TransNamib Holdings Ltd
USEPA	United States Environmental Protection Agency
WBBT	Walvis Bay Bulk Terminal

EXECUTIVE SUMMARY

Social and Environmental Impact Assessment: Proposed Mine Expansion Project Phase 2a ~ Sulphur Handling Facility in the Port of Walvis Bay

BACKGROUND

Rio Tinto Rössing Uranium (Rössing Uranium) 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, Rössing Uranium is able to consider the possible financial benefit from an expansion of its operations beyond 2016.

In terms of the Namibian Constitution (Government of Namibia, 1990) and related environmental legislation, in particular the Environmental Assessment Policy (MET, 1995), the proposed expansion activity would require authorisation from the responsible authorities before it can be undertaken. Insofar as the environmental acceptability of Rössing Uranium'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.

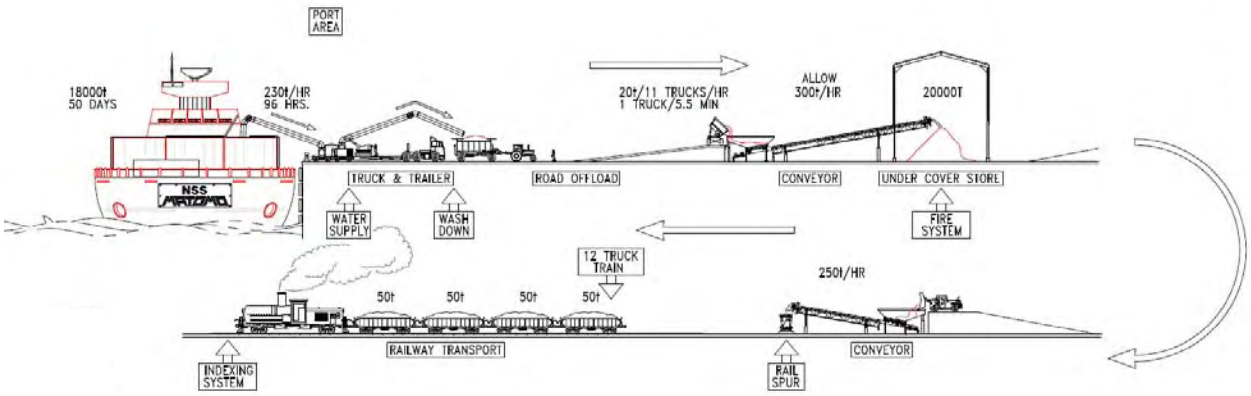
A Social and Environmental Impact Assessment (SEIA) has thus been commissioned by Rössing Uranium for their proposed expansion project, as required by the Environmental Assessment Policy (MET, 1995) but also informed by the principles of the Environmental Management Act and the Labour Act, as well as the internal standards and guidelines prescribed by Rio Tinto, Rössing Uranium's parent company. The clearance would be based on the outcomes of the SEIA, as documented in the various reports that underpin the entire assessment process.

This Draft SEIA Report has collated, interrogated, analysed and synthesized information from a range of sources, including specialist studies and it is believed that it provides sufficient and reliable information for informed decision-making regarding the proposed sulphur handling facility in the Port of Walvis Bay by the relevant authorities.

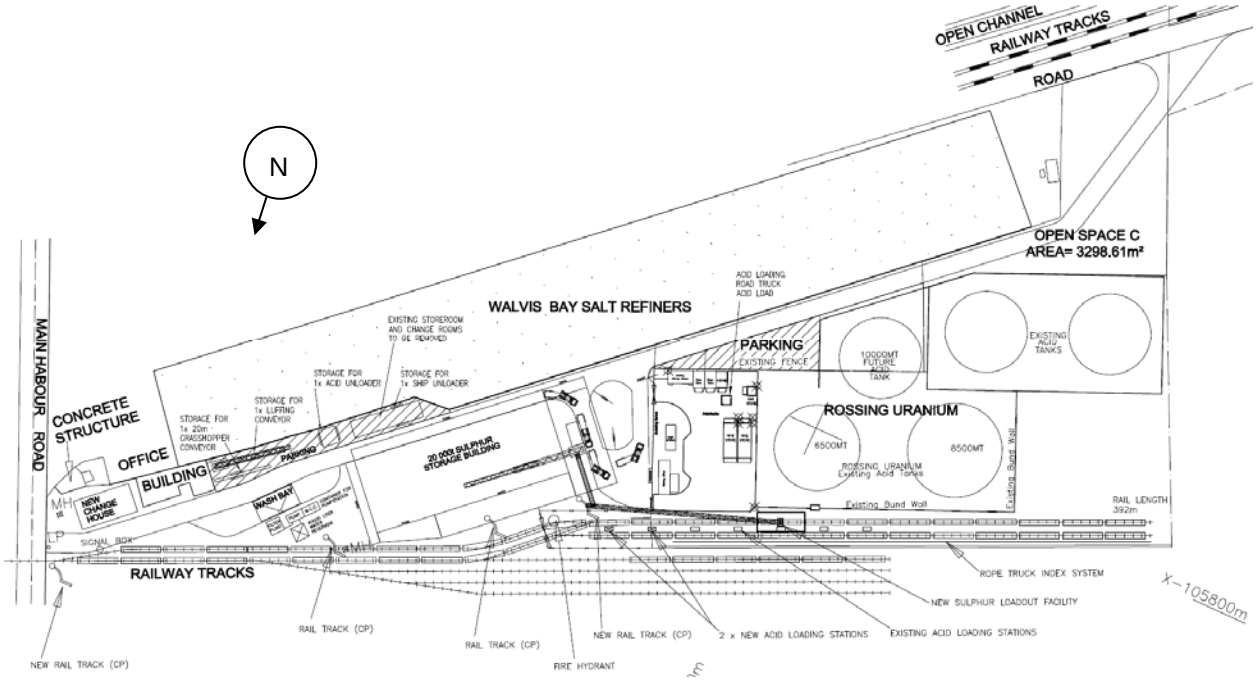
PROJECT DESCRIPTION

Rössing Uranium's metallurgical process uses sulphuric acid leaching to extract the uranium from the ore. An onsite pyrite burning acid plant was in use until 1997, after which it was converted to burn elemental sulphur imported through Walvis Bay and railed to the mine. This production plant was mothballed in 2000 when prices of imported acid fell below production cost. Since 2000, the entire mine's acid requirements have been imported via the Port of Walvis Bay and railed inland to the mine. Current economic evaluations show that benefit may be gained by establishing a new sulphuric acid production plant at the mine, while continuing to import additional sulphuric acid as and when required.

In order to achieve this, Rössing Uranium proposes the construction of a 20 kt sulphur storage shed inside the port area with associated facilities and handling equipment. A number of site and technological alternatives have been considered during the SEIA process and the preferred alternative is described below. The following diagram provides an overview of the activity description to follow.



High-quality, degassed and prilled elemental sulphur would be shipped to the Walvis Bay Bulk Terminal (WBBT) at an estimated 50-day interval. A mobile Siwertell continuous screw unloader would reclaim the sulphur from the ship to a waiting tractor-drawn side-tipping trailer. Unloading operations shall run 24 hours day when the ship is in dock and is estimated to take 4 days to unload each ship. The sulphur will be transported in trailers to the sulphur storage shed located seaward of the existing Rössing Uranium sulphuric acid tank farm.



The storage shed shall comprise a 3,000 m^2 mild steel frame and fibre-cement sheeting clad structure capable of stockpiling 20,000 t of sulphur. The storage shed will be equipped with various conveyor belts and mobile plant to allow for the management and handling of the sulphur within the shed. The shed will also be equipped with various required ancillaries including ablutions, a water treatment plant, wash bays, fire systems and the like. The existing railway lines inside the port area will be extended to service the sulphur loading area at the shed.

To meet the demand for the acid production at the mine, it is estimated that five trains per week, comprising 12 hopper wagon type railcars of 50 t capacity each, will need to make the journey between the port and the mine.

POTENTIAL IMPACTS IDENTIFIED DURING THE SCOPING STAGE

One of the main purposes of the SEIA process is to understand the significance of the potential impacts resulting from the sulphur handling facility and its associated activities and infrastructure, and to determine the most suitable project alternative. During the SEIA process the following potential impacts were identified:

Construction phase impacts could potentially include:

- The extent of employment opportunities created as a consequence of the proposed developments, both for permanent and contracted workers;
- Impacts on water resources, namely groundwater;
- Interference with current commercial activities in the port in the vicinity of the construction site;
- Management of materials required for construction or establishment;
- Increase in traffic volumes to the port and in the vicinity of the construction sites;
- Windblown dust;
- Interference with train movements in the port area during the extension of the railway lines;
- Noise pollution and vibration; and
- Pollution from construction waste and other contaminants.

Based on the temporary duration of the construction phase and the fact that negative impacts of construction, in general, can be reliably predicted and mitigated, more attention is given to the operational phase impacts of the proposed sulphur handling facility than to the construction phase impacts. Moreover, the construction phase impacts related to the sulphur handling facility are assessed as being of low significance.

Operational phase impacts associated with the bulk storage and handling of sulphur in the port area includes:

- Permanent employment creation;
- The risk of sulphur fires and explosions in the storage shed and the potential impact of such an occurrence on the environment;
- The human health and environmental hazard associated with elemental sulphur as a pollutant:
  - The health, safety and environmental risk associated with a spillage of sulphur during its handling and transport in both the port area and in the public domain;
  - The generation and release of sulphur dust into the surroundings and the potential impact on human health and the biophysical environment; and
  - The risk posed by sulphur residue on handling equipment and how this will be managed;
- The potential increase in noise and vibration and the associated impact on the nearby residential areas;
- The potential visual impact of the proposed sulphur handling shed;
- The lack of space in the port to accommodate the proposed facility and the potential negative impacts on existing economic activities in the port;
- The impact, management and risk associated with potential train accidents at railroad crossings;
- The risk of other commodities stored in the port being contaminated by elemental sulphur; and
- The control and treatment of sulphur contaminated water from the storage facility.

THE PUBLIC PARTICIPATION PROCESS

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 have an opportunity during SEIA process to gain more knowledge about the proposed project, to provide input and to voice any issues of concern. Stakeholders were given opportunity to participate in the Scoping Stage of the present SEIA process and potential impacts and concerns raised form part of those listed under the previous heading.

The identified stakeholders were invited to attend a focus group meeting that was held on 7 February 2008 in Walvis Bay. A Public Information Document aimed at informing I&APs and stakeholders about the proposed development by Rössing Uranium and to promote participation in the SEIA process was also disseminated to the identified stakeholders.

Eighteen of the identified stakeholders attended the focus group meeting held on 7 February 2008, co-ordinated by Marie Hoadley, the public participation manager for the SEIA process, and three delegated representatives from Rössing Uranium were present to respond to queries and provide insight into the technical workings of the proposed project and Rössing Uranium's operations at large.

During the SEIA Stage of the process, public participation will comprise the following:

- ongoing registration of and engagement with stakeholders who have, subsequent to the Scoping Stage, expressed an interest in the participation process;
- presenting the findings of the Draft SEIA Report to identified stakeholders and the public at large;
- recording stakeholder and I&AP issues, comments and any corresponding responses; and
- investigating issues at greater depth where the need for this has been indicated.

All the identified stakeholders will be notified by way of letter of the availability of the Draft SEIA Report, the locations where the report can be viewed and the date by which any comments they may have must be returned. Concurrently, newspaper adverts will be commissioned to notify the public of the same. Copies of this Draft SEIA report will be lodged for public viewing at the libraries in Swakopmund, Walvis Bay, Windhoek and Arandis, as well as being placed on Rössing Uranium's and Aurecon's websites.

Comments and issues received from the I&APs and stakeholders will then be captured, considered and responded to during the finalisation of the SEIA Report for final submission to MET:DEA.

Should MET:DEA believe that the final submission contains sufficient information to allow for sound decision-making, they will consider issuing a clearance for the project. Such clearance may include certain conditions, e.g. the undertaking of environmental controls as stipulated in the SEMP that accompanies this SEIA Report.

All registered I&APs and stakeholders will be informed of MET:DEA's decision once it is made available and in the event that an I&AP or stakeholder wishes to appeal the decision, details regarding the appeal process will also be furnished.

ASSESSMENT OF POTENTIAL IMPACTS AND POSSIBLE MITIGATION MEASURES

The methodology applied during this SEIA uses a tabulated rating system, where each impact is described according to its extent (spatial scale), magnitude (size or degree scale) and duration (time scale). These criteria are used to ascertain the significance of the impact, with and without mitigation. 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 is determined. Lastly, the reversibility of the impact is estimated. Challenges faced during the application of the methodology as described relate to the subjectivity in assigning significance to an impact and the consideration of cumulative impacts.

The following table provides a summary of the significance of the potential social and environmental impacts associated with this proposed project. In recognising the extent of the information available at this stage of the project planning cycle, the confidence in the assessment undertaken is regarded as acceptable for informed decision making.

CONCLUSIONS AND RECOMMENDATIONS

The significance of the potential impacts associated with the construction and operational phases of the proposed sulphur handling and storage facility in the Port of Walvis Bay have been assessed and the outcomes presented in the summary table below. The assessment of identified impacts relates to the preferred alternative and is based on determining the social and environmental acceptability after best available technology or appropriate mitigations have been applied.

Aspect	Impact	NO MITIGATION	MITIGATION
Operational Phase			
Socio-economic environment	Impact on permanent employment creation	Very low (+)	Low (+)
	Impact on worker health and safety in a sulphurous work environment	Low (-)	Low (-)
	Impact on economic environment associated with a sulphur fire or explosion	-----	Low (-)
	Risk to employees in the event of a sulphur fire or explosion	-----	Low (-)
	Risk to the public in the event of a sulphur fire or explosion	-----	Low (-)
	Impact of increased environmental noise on environment	Very low (-)	Very low (-)
	Visual Impact of the sulphur handling facility	Low (-)	Very low (-)
	Impact of sulphur contamination of other commodities and materials in the port	-----	Low (-)
Biophysical environment	Impact of potential sulphur contamination on the Walvis Bay RAMSAR site	-----	Very low (-)
	Release of sulphur contaminated runoff	-----	Very low (-)
Construction phase impacts			
Construction Phase Impacts	Generic construction phase impacts	-----	Very low (-)
	Impact on employment creation during construction	Very Low (+)	Very Low (+)

Impact Significance Legend							
High (+)	Medium (+)	Low (+)	Very low (+)	Very low (-)	Low (-)	Medium (-)	High (-)

Since the proposed location for the sulphur handling facility can be found within the significantly modified industrial zone of the Port of Walvis Bay, impacts on the biophysical environment from the facility are likely to be virtually negligible. The majority of the significant potential environmental impact is related to the handling and storage of sulphur. Whilst elemental sulphur is non-toxic and relatively benign, the handling and storage of this material does pose certain risks, including sulphur dust explosions, fires, contamination of other nearby commodity stockpiles and the release of deleterious sulphurous compounds should the elemental sulphur decay. Through sound planning, appropriate operational controls and facility design, these risks can be reduced to acceptable level, as reflected in the above summary table.

THE WAY FORWARD

This Draft SEIA Report has been released for review and comment by I&APs and stakeholders, and opportunities for their input are being provided. The comment period for public participation closes on 06 December 2009.

Once all the comments and concerns raised by I&APs, stakeholders and the authorities have been received, the draft will be revised and updated. Comments and concerns will be reflected in stakeholder feedback forms that also provide the SEIA team's responses to the submissions. In this way, people or organisations that make submissions can confirm that their concerns are addressed. If the concerns raised require action or further investigation, these will be undertaken where appropriate. The final version of the SEIA Report will then be submitted to MET:DEA for their consideration.

In considering this SEIA Report, MET:DEA will ascertain whether the process undertaken is acceptable and whether there is adequate information to allow for an informed decision. Should the above be acceptable, they will need to decide on the social and environmental acceptability of the proposed project. MET:DEA's decision will be documented by a clearance of the project that will detail the decision and describe any conditions they might impose. Following the issuing of the MET:DEA clearance, their decision will be communicated by means of a letter to all registered I&APs and stakeholders.

As the environmental practitioners responsible for leading this SEIA process, Aurecon are of the opinion that the proposed project being assessed and applied for, namely the sulphur handling facility in the Port of Walvis Bay, should be positively received by MET:DEA and that an environmental clearance should be issued. This opinion is based on our comprehensive understanding of the environmental impacts likely to result from the sulphur handling activities as detailed in this and preceding documentation, and that the implementation of alternatives and mitigation measures as described and recommended will reduce the identified environmental impacts to an acceptable level.

06 November 2009

INTRODUCTION AND BACKGROUND

The purpose of this chapter is to provide the context for Rio Tinto Rössing Uranium's proposed expansion project and to introduce and contextualise the Social and Environmental Impact Assessment Report for the proposed sulphur handling facility in the Port of Walvis Bay. After providing the background, it describes the policy and legal framework within which the assessment has been undertaken. Thereafter, the chapter outlines the assessment process to date, its assumptions and limitations, and the approach to the present stage in the assessment process. This chapter ends with a brief section on the context and structure of the remaining chapters of the report.

Introduction

Rio Tinto Rössing Uranium Limited (Rössing Uranium) has operated an open pit uranium mine in the Erongo Region of Namibia since 1976. Figure 1 overleaf provides a locality map for the mine. Although of considerable extent, the Rössing Uranium 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 the recent upward trend in uranium prices on the international market, and projected further increases in future, Rössing Uranium is able to consider possible expansion of its operations. The increased demand for uranium is primarily driven by rapidly growing international energy demands and associated increased future reliance on nuclear energy. Rössing Uranium is thus considering extending its mine plan. Consequently, the associated social and environmental issues are being assessed in a multiphase Social and Environmental Impact Assessment (SEIA[1]), focusing on specific expansion project components.

In terms of the Namibian Constitution (Government of Namibia, 1990) and relevant environmental legislation, in particular the Environmental Management Act (Act No 7 of 2007), the proposed expansion activity would require authorisation from the responsible authorities before it can be undertaken. Insofar as the social and environmental acceptability of Rössing Uranium'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, based on comments from the Ministry of Labour and Social Welfare.

A SEIA has thus been commissioned by Rössing Uranium for their proposed expansion project, as required by the Environmental Assessment Policy (MET, 1995) but also informed by the principles of the Environmental Management Act and the Labour Act, as well as the internal standards and guidelines prescribed by Rio Tinto, Rössing Uranium's parent company. The clearance would be based on the outcomes of the SEIA, as documented in the various reports that underpin the entire assessment process.

[1] It is recognised that the term "environment" when applied in the context of an environmental impact assessment refers to the total environment, encompassing both the socio-economic and biophysical environments. However, Rössing Uranium prefers to retain the term "social" in the title of the present environmental impact assessment, as a clear indication of their commitment to the human element in the affected environment and in keeping with their Sustainable Development Frameworks.

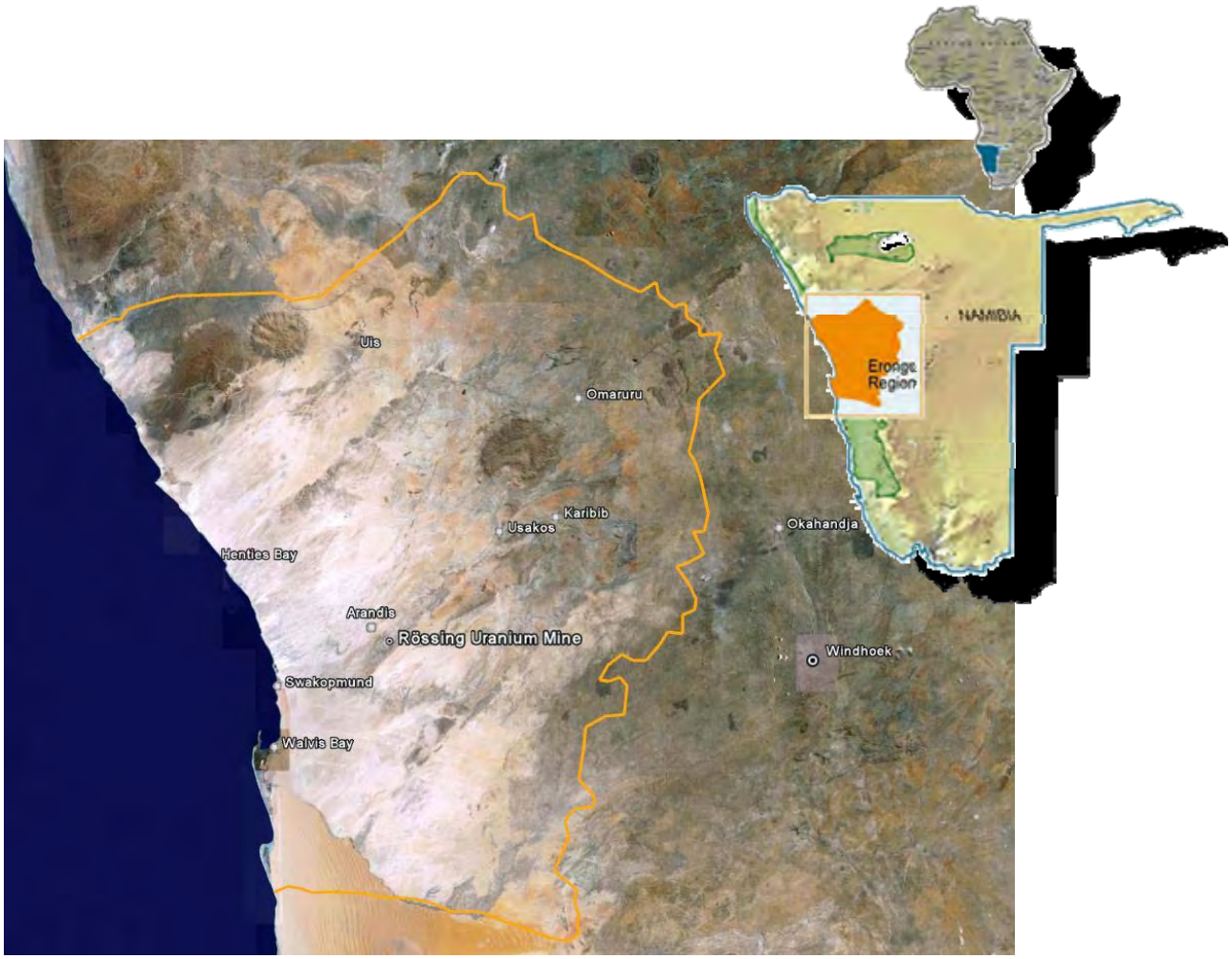


Figure 1: Locality map[2]

The entire extent of the envisaged expansion of the Rössing Uranium mine would comprise, in summary, nine individual components. These are being dealt with in two phases of the SEIA process, as follows:

- A sulphuric acid manufacturing plant with associated sulphur storage on the mine, and the transport of sulphur from the Port of Walvis Bay;
- A radiometric ore sorter plant;
- Mining of an ore body known as SK4;
- ***Sulphur handling in the Port of Walvis Bay.*** ***Current SEIA***
- Extension of the current mining activities in the existing SJ pit;
- Increased waste rock disposal capacity;
- Increased tailings disposal capacity;
- Establishing an acid heap leaching facility; and
- Establishment of a ripios disposal area.

Phase 1

Phase 2

It should be noted that due to technical reasons, the list of Phase 2 SEIA project components has changed since the submission of the Phase 2 final scoping report. Changes are the exclusion of the "New mining activity in the larger SK area" which is no longer being pursued, and the addition of

[2] Source: Rio Tinto Rössing Uranium Limited

"Establishment of a ripios disposal area" to highlight the need to assess this component separately, even though it was always deemed to have been included in "Establishing an acid heap leaching facility" component.

The reason for separating these components into the two main SEIA phases is that the engineering design and detailed feasibility studies for each of the nine components are not occurring simultaneously. This is due to the complex and highly technical nature of the various expansion project components necessitating a sequential approach to the execution of the proposed developments. It is understandable that economic and engineering criteria may influence the feasibility of Rössing Uranium's entire expansion project during the formulation and approval stages of the project cycle.

Originally, the sulphur handling in the Port of Walvis Bay was excluded from the Phase 1 SEIA due to the fact that Grindrod, the lessee and operator of the Bulk Handling Terminal in the Port of Walvis Bay, had embarked on an environmental assessment for a sulphur handling facility themselves. However, since that time, Rössing Uranium has identified additional potential locations for such a facility and wish to assess the suitability of these locations which fall outside the scope of the Grindrod assessment.

The sulphur handling facility has thus been introduced as part of the Phase 2 SEIA process, referred to as Phase 2a. Due to the sulphuric acid manufacturing plant on the mine having already received a clearance from MET:DEA during the Phase 1 SEIA, and its reliance on elemental sulphur as feedstock to operate, it was decided to separate the sulphur handling component in the port from the remainder of the Phase 2 SEIA components. It is thus being subjected to an individual SEIA process in the interests of time and to allow for an earlier clearance than the remaining Phase 2 SEIA components, to be submitted as the Phase 2b SEIA later in the process.

It is therefore important to note that, whilst the sulphur handling facility in the Port of Walvis Bay formed part of the original combined Phase 2 Scoping Report, along with the other Phase 2 components, it is the only component addressed in the present Phase 2a SEIA Report. It should also be noted that the associated transport of sulphur from the port to the mine, and its storage, handling and further processing, were dealt with during the Phase 1 SEIA.

The SEIA process for the proposed sulphur handling facility in the Port of Walvis Bay, and its sequence of supportive documentation, is illustrated in Figure 2.

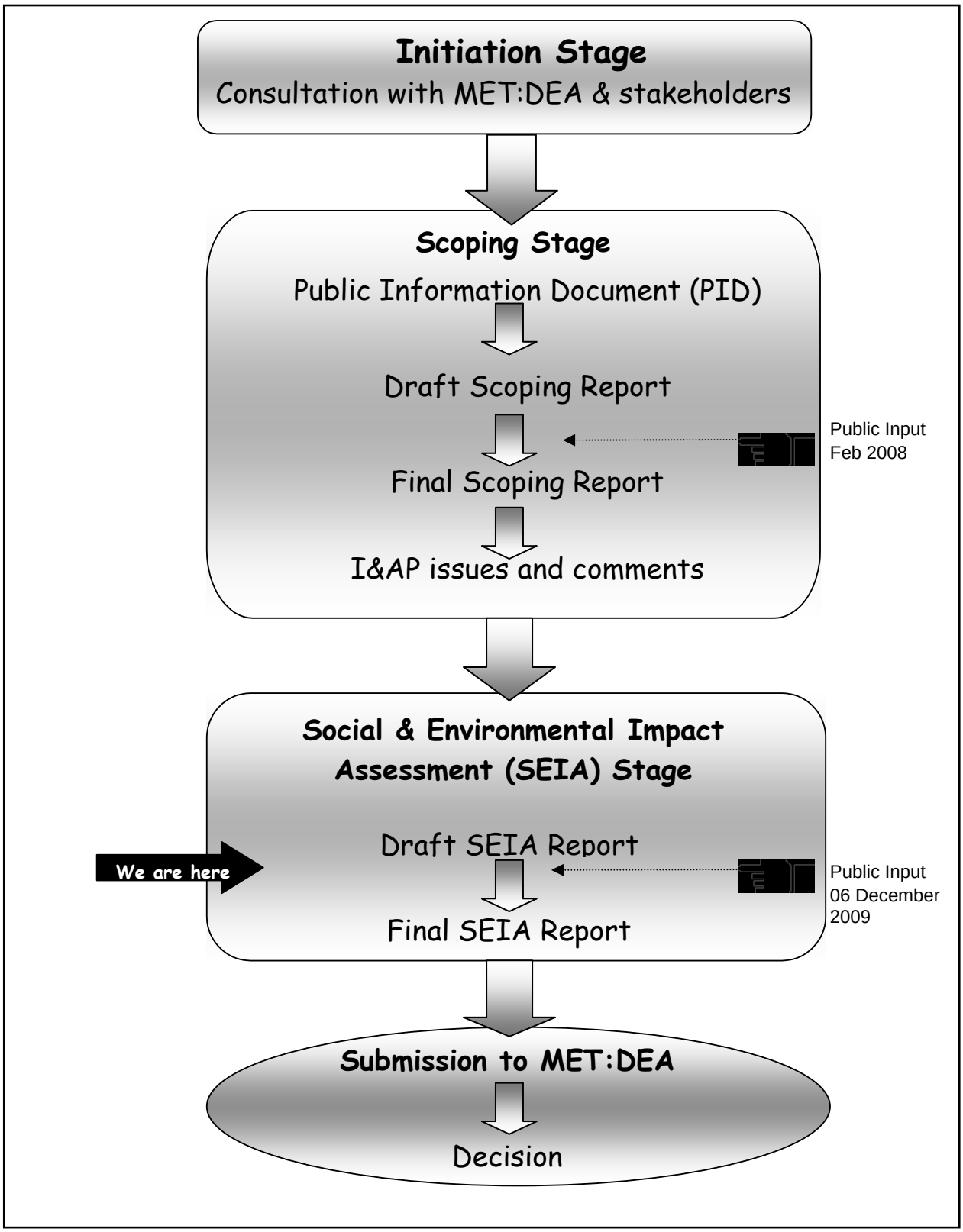


Figure 2: The SEIA process

The series of documents that support the Phase 2a SEIA process for sulphur handling in the Port of Walvis Bay, and that will culminate in a final Phase 2a SEIA Report, comprise the following:

- A Public Information Document (PID) released on 4 February 2008 to initiate the SEIA process;
- A Draft Scoping Report released on 10 April 2008 for public review and comment;
- A Final Scoping Report released on 9 May 2008 and submitted to MET:DEA;
- The present Draft Phase 2a SEIA Report released in 06 November 2009 for public review and comment; and
- A Final Phase 2a SEIA Report for submission to MET:DEA.

A bibliography is included in Section 7 of this report that provides reference to other studies and reports that are of relevance to this draft Phase 2a SEIA Report.

The purpose of this draft Phase 2a SEIA Report is to document the assessment stage of the sulphur handling facility in the Port of Walvis Bay, which briefly comprises the following:

- An outline of the legal and policy framework regarding the environment within which Rössing Uranium operates and this assessment is undertaken;
- A description of the proposed project, its alternatives and potential impacts;
- A description of the public participation process undertaken to date, and the way forward with this process;
- A description of the assessment methodology applied; and
- Most importantly, an assessment of the significance and possible mitigation of the potential impacts that were identified during the scoping stage of the SEIA process.

Specialist studies have been undertaken to properly understand the most significant potential impacts of the proposed sulphur handling facility and associated activities, and to ensure an acceptable level of confidence in the assessment of such impacts.

As indicated in Figure 3, the SEIA Report stage is the final stage in the SEIA process before a decision is taken. Accordingly, an SEIA Report aims to collate, interrogate, analyse and synthesize information from a range of sources to provide sufficient and reliable information for MET:DEA to make an informed decision on whether or not the proposed sulphur handling facility in the Port of Walvis Bay, as a component of Rössing Uranium's expansion project, is acceptable from a social and environmental perspective.

Policy framework

As a significant contributor to the Namibian economy[3], Rössing Uranium's role in local and regional economic development requires that they demonstrate 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 hierarchy of policy, planning and procedural documentation seen in Figure 3 reflects the point of departure for the proposed expansion project and consequently has bearing on the SEIA for the proposed sulphur handling facility in the Port of Walvis Bay.

[3] In 2001 Rössing Uranium contributed 2.5% of Namibia's Gross Domestic Product (GDP) and 10% of the country's export earnings (Rössing Uranium, 2004).

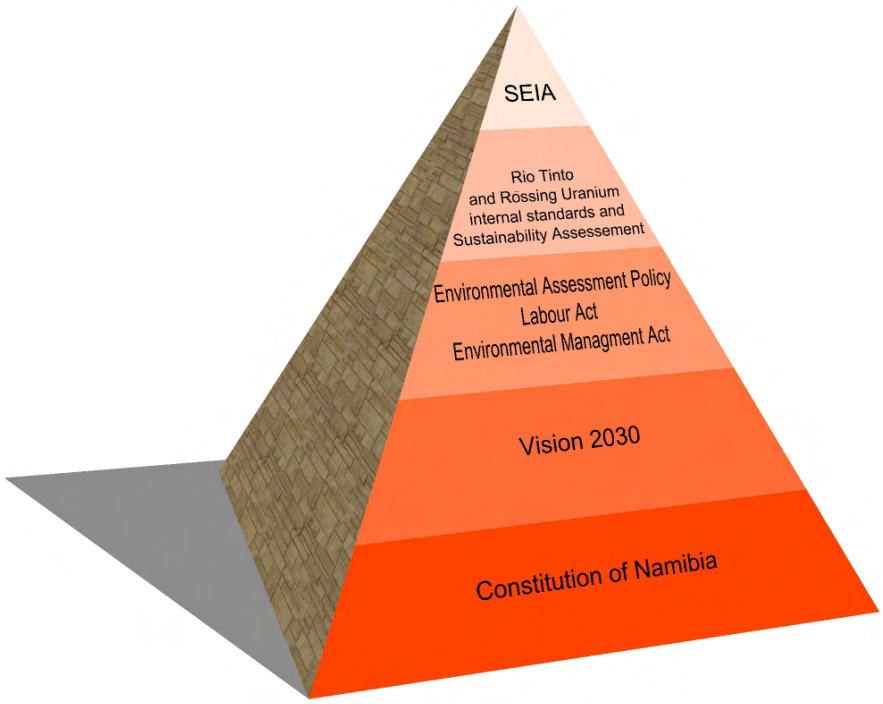


Figure 3: Hierarchy of policy and planning documents

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 "Legal Requirements, Standards and Conventions", together with other standards, conventions and relevant pending legislation.

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, Rössing Uranium has demonstrated its alignment with these constitutional principles.

Vision 2030

The principles that underpin Vision 2030[4], 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, Rössing Uranium is in a position to contribute significantly to the realisation of the Vision 2030 principles.

Other forward-planning initiatives related to the Vision 2030 policy towards Namibia's national development, the tourism sector and to natural resource management are the Erongo Region Development Plan (2000), MET's North West Tourism Master Plan and the Namib Coast Conservation and Management project.

Environmental 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 being approved by the Namibian Parliament in October 2007. It was gazetted on 27 December 2007 as the Environmental Management Act (No. 7 of 2007), Government Gazette No. 3966[5]. Part 1 of the Environmental 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*[6] 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 there from 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.

[4] Derived from Namibia's Green Plan drafted by MET in 1992 and followed by the sequence of National Development Plans.
[5] Regulations that will provide the enabling legislation for this Act are presently being formulated.
[6] Definition: Latin for 'place to stand', in law, the right to bring an action

- 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 "Environmental Assessment Policy of 1994", there is a clear commitment to pursuing these principles of environmental management on the part of Rössing Uranium as the proponent of the expansion project and the associated sulphur handling facility in the Port of Walvis Bay.

Labour Act

The proposed sulphur handling facility in the port of Walvis Bay is classified as a factory and consequently, in terms of the Labour Act (Act No. 6 of 1992), the Environmental Consultant undertaking the assessment must register as an inspection authority with the Ministry of Labour & Social Welfare. The application and supporting documentation registration process has been included here as Appendix A.

Rössing Uranium Sustainability Assessment

In determining the viability of extending the life of the Rössing Uranium mine, a detailed sustainability assessment (Rössing Uranium, 2004) was undertaken. 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.

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 as 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, by quantifying the net environmental[7] benefit or detriment of the proposed expansion project, positioned Rössing Uranium to consider the next step in the development process, namely whether or not the project could be implemented within acceptable social and environmental parameters. The sustainability assessment is consequently a vital strategic informant in undertaking all phases of the SEIA for the proposed expansion project.

[7] 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.

Legal Requirements, Standards and Conventions

In order to protect the environment and ensure that Rössing Uranium's proposed expansion project is undertaken in an environmentally responsible manner, the most significant piece of environmental legislation that focus this assessment is Namibia's Environmental Assessment Policy. This is reflected below, followed by reference to other legislation, standards and conventions of secondary importance.

Environmental Assessment Policy of 1994

Appendix B of the Environmental Assessment Policy contains a schedule of activities that will have significant detrimental effects on the environment and which require authorisation from MET:DEA. The nature of Rössing Uranium's proposed expansion project includes activities listed in this schedule. The primary triggers[8] which may be relevant to the proposed sulphur handling facility in the Port of Walvis Bay are, *inter alia*:

> *"10~ Transportation of hazardous substances and radioactive waste*
>
> *14~ Storage facilities for chemical products*
>
> *16~ Bulk distribution facilities*
>
> *39~ Effluent plants*

Accordingly, the proposed sulphur handling facility requires authorisation from MET:DEA, and their decision will be based on the findings of the present SEIA process. The aim of the SEIA process being undertaken is to meet the requirements for such processes, as described in Appendix A of the Environmental Assessment Policy.

Rio Tinto and Rössing Uranium Internal Standards

Rio Tinto, Rössing Uranium's parent company, operates within 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 subsidiaries, such as Rössing Uranium, are committed to achieving and 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 Rio Tinto Health, Safety, Environment and Quality (HSEQ) Management System, that each business unit, like Rössing Uranium, is obliged to maintain. The HSEQ System is based on the principles of internationally applied management systems for health, safety, environment and quality, including the relevant ISO standards. Rössing Uranium was certified as being compliant with the ISO 14001 EMS in February 2001 and recertified in 2004 and 2007. Certification services and independent third party auditing will continue through a Rio Tinto nominated international auditing organisation to ensure continued compliance to the standard throughout the group.

Specifically as it relates to the proposed sulphur handling facility, the planning component of Rössing Uranium's EMS requires that the project be 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 local statutory requirements and international best practice.

[8] Given the complex nature of the proposed expansion project, other activities may also serve as triggers. However, the comprehensive SEIA being undertaken will address all of the impacts identified during the process.

Other legislation and conventions

In addition to the Environmental Assessment Policy and Rössing Uranium's internal standards described above, the following additional pieces of existing or pending legislation and conventions were considered during the course of the SEIA process:

The socio-economic environment~

- Combating of Rape Act (2002)
- Decentralisation Policy (1998)
- Labour Act (1992), in particular the Regulations relating to the health and safety of employees at work (Government Notice No. 156 of 1997)
- Marriage Equality Act (2002)
- National Code on HIV/AIDS and Employment (1996)
- National Employment Policy (1997)
- National Environmental Health Policy (2002)
- National Heritage Act (2004)
- Primary Health Care Policy (1990)

The biophysical environment~

- Air Quality Act (2004)
- Atmospheric Pollution Prevention Act (1965)
- Atmospheric Pollution Prevention Ordinance (1976)
- Convention on Biological Diversity (2000)
- Environmental Management Act (2007)
- Namibian Water Corporation Act (1947)
- Pollution and Waste Management Bill (Draft)
- Ramsar Convention (1975)
- United Nations Framework Convention on Climate Change (1992)
- Water Act (1956) and yet to be enabled Water Act (2004)
- Water Resources Management Act (2004)

The extent to which these pieces of legislation and conventions may be relevant to the undertaking of the SEIA for sulphur handling in the Port of Walvis Bay are being evaluated as the process continues. To date, no specific concerns have been raised regarding other legislation or conventions. Other government departments and statutory institutions that may have an interest in or responsibility for the SEIA process, such as the Ministry of Labour, the Ministry of Health and Social Services, the Department of Mines and Energy, NamPower, NamPort and TransNamib will be provided with copies of the Draft SEIA Report, for their review and comment.

The SEIA process to date

The SEIA process being undertaken is illustrated in Figure 2. As can be seen, the Initiation and Scoping Stages have been completed and the SEIA Report Stage is well advanced. To date, the SEIA process has comprised the following tasks:

- Communication with the Head of the Environmental Impact Assessment Unit at MET:DEA on 29 January 2008, confirming the approach to the SEIA for the sulphur handling facility in the Port of Walvis Bay. A copy of this letter was provided in the Scoping Report and represents the formal initiation of the SEIA process for sulphur handling in the port;
- Undertaking an identified stakeholder focus group meeting with national, regional and local government authorities and other statutory institutions on 7 February 2008. This vital component of

the SEIA process was the responsibility of Marie Hoadley, an independent public facilitation and social assessment practitioner. The stakeholder focus group meeting and the overall public participation tasks involved in the SEIA process are reported in detail later in this report;
- Compilation and distribution of a Draft Scoping Report during April 2008;
- Revision and submission of the Final Scoping report during May 2008;
- Commissioning of specialist studies, after the focus group meeting, and finalisation of the scope of their work. Copies of the specialist reports are provided in Annexures D1, D2 and D3;
- Compilation of this Draft SEIA Report, after receiving the specialist reports and further consultation with key stakeholders and project team members; and
- Submission of the Draft SEIA Report to MET:DEA as the primary environmental authority, as well as its release to Interested and Affected parties (I&APs) and other identified stakeholders.

A revision of the Draft SEIA Report, in response to inputs from authorities, I&APs, stakeholders and the project team, will result in a final version for submission to MET:DEA for their ultimate decision-making.

The Draft SEIA Report has collated, interrogated, analysed and synthesized information from a range of sources and it is believed that it provides sufficient and reliable information for informed decision-making regarding the proposed sulphur handling facility in the Port of Walvis Bay.

Assumptions and limitations

This SEIA Report is limited to the sulphur handling facility in the Port of Walvis Bay, as described in "Introduction", and is being undertaken in terms of the Environmental Assessment Policy and internationally recognised best practice in environmental assessment. In developing the approach to this project, Aurecon took cognisance of Rössing Uranium's deliberations regarding the sustainability assessment (Rössing Uranium, 2004) for the extension of the life of the mine.

Regarding the assessment of relevant project-level alternatives, it emerged that the number of such alternatives is limited. This is not a shortcoming in the process, however, since the principle of applying best practice and the adoption of the most environmentally appropriate technology has informed the engineering design of the proposed sulphur handling facility. The SEIA nevertheless determines the acceptability of such best practice and appropriate technology.

Approach to the SEIA Stage

The SEIA Report Stage

There are three distinct phases or stages in the SEIA process, as described generically in Appendix A of the Environmental Assessment Policy, namely the Initiation Stage, the Scoping Stage and the SEIA Report Stage. Figure 2 in "Introduction" summarises the process followed. This document addresses the initial portion of the final stage, namely the Draft SEIA Report.

The purpose of this Draft SEIA Report is to describe and assess the range of project actions and the feasible alternatives formulated (where possible) during the process thus far. It identifies the potential social and environmental impacts and gives stakeholders and I&APs the opportunity to review and comment on the findings. The ultimate purpose of the SEIA Report is to provide a basis for informed decision-making, firstly by Rössing Uranium as the proponent, with respect to the development options they wish to pursue, and secondly by the authorities regarding the acceptability of the proponent's preferred development options.

The approach to the SEIA Report Stage has entailed the following:

- Undertaking further review of relevant information;

- Appointing various specialists to undertake the specialist studies identified during the Scoping Stage, namely:
  - Visual impact assessment, undertaken by Visual Resource Management Africa;
  - Environmental noise assessment, undertaken by JH Consulting; and
  - The human health implications associated with elemental sulphur, undertaken by Infotox; and
- Compiling this Draft SEIA Report, based on the collation, interrogation, analysis and synthesis of all relevant information. This allows for the description and assessment of the significance of identified potential impacts associated with the proposed sulphur handling facility, with the objective of providing a balanced view of the proposed activities and their implications for the environment. The relevant information referred to includes the specialist reports, the comments and concerns from the public and stakeholders, and input from the project team.

Decision-making and authority involvement

As indicated earlier, MET:DEA is the competent environmental authority and will make a decision in light of the information presented in the Final SEIA Report. If the decision is positive, MET:DEA will issue a clearance for the proposed development.

There are other authorities and institutions that have a commenting role to play in the SEIA process. Their comments on the SEIA Report will help to inform MET:DEA's decision making. These authorities and institutions include *inter alia*:

- Walvis Bay Municipality;
- Ministry of Labour,
- Ministry of Health and Social Services;
- Ministry of Mines and Energy;
- NamPower:
- NamPort; and
- TransNamib.

Context and structure of this report

The structure of this Draft SEIA Report has been guided by the Environmental Assessment Policy. It has also been informed by the South African Department of Environmental Affairs and Tourism's *Environmental Impact Reporting Guideline* (Government of South Africa, 2004a), as well as by the review approach formulated by the Southern African Institute for Environmental Assessment that appears as Appendix A of the *Review in EIA Guideline* (Government of South Africa, 2004b). In this way, informed decision-making by the proponent and the competent environmental authority ought to be facilitated. The Draft SEIA Report contains the following information:

- A description of the approach adopted and methodology used in compiling the documentation;
- A description of the proposed sulphur handling facility and associated operations;
- An assessment of the alternatives relevant to the proposed sulphur handling facility;
- A description of the potential impacts associated with the proposed sulphur handling facility and associated operations;
- A consideration of measures to mitigate the potential impacts;
- A conclusion and various recommendations with regard to the way forward;
- A series of annexures containing relevant information, including the specialist studies and details of the public participation process; and
- A non-technical summary.

This Draft SEIA Report is structured as follows:

Chapter One	Provides the introduction, policy and legislative framework, details of the SEIA process and approach to the assessment;
Chapter Two	Describes the project proposal, including identification of alternatives and potential impacts;
Chapter Three	Describes the public participation process;
Chapter Four	Describes the assessment methodology;
Chapter Five	Discusses and assesses the identified potential impacts and mitigation measures;
Chapter Six	Concludes the report, describes the recommendations being made and indicates the way forward; and
Chapter Seven	Provides a bibliography.

PROJECT DESCRIPTION AND IDENTIFICATION OF ALTERNATIVES AND POTENTIAL IMPACTS

The purpose of this chapter is to provide a technical description of the proposed sulphur handling facility in the Port of Walvis Bay, as well as the identification of project alternatives. The identification of potential impacts considered for further evaluation during the assessment stage of the present SEIA process is also described.

Project description

Context

The maximum extent of Rössing Uranium's envisaged mine expansion project in entirety would entail the mining of new areas, with new disposal areas for waste rock, new or expanded processing plants (including a sulphuric acid plant and associated sulphur handling facilities at both the mine and in the Port of Walvis Bay), additional tailings dam capacity, a heap leach system of extraction of the product and associated ripios (or spent ore) disposal site, and an associated increase in staff numbers and facilities.

The Phase 1 SEIA for the expansion project dealt with the proposed establishment and operation of a sulphur burning plant for the production of sulphuric acid at the Rössing Uranium mine, and the associated transport of elemental sulphur from Walvis Bay to its storage facility at the mine site. A brief description of this is provided herewith, for ease of reference.

Rössing Uranium's metallurgical process uses sulphuric acid leaching to extract the uranium from the ore. An onsite pyrite burning acid plant was in use until 1997, after which it was converted to burn elemental sulphur imported through Walvis Bay and railed to the mine. This production plant was mothballed in 2000 when prices of imported acid fell below production cost. Since 2000, the entire mine's acid requirements have been imported via the Port of Walvis Bay and railed inland to the mine. Current economic evaluations show that benefit may be gained by establishing a new sulphuric acid production plant at the mine, while continuing to import additional sulphuric acid as and when required. Figure 4 provides a graphic representation of the acid production history at Rössing Uranium since 1976 and a forecast of future acid requirements up to 2014.

In essence, the sulphuric acid produced will be converted from elemental sulphur feedstock that is shipped to the Port of Walvis Bay and railed to the proposed acid plant on the mine. The manufacture of sulphuric acid at Rössing Uranium would be done via a two-step oxidation process of elemental sulphur (S) to sulphur trioxide (SO_3) which would be absorbed into a 98.5% sulphuric acid solution (H_2SO_4).

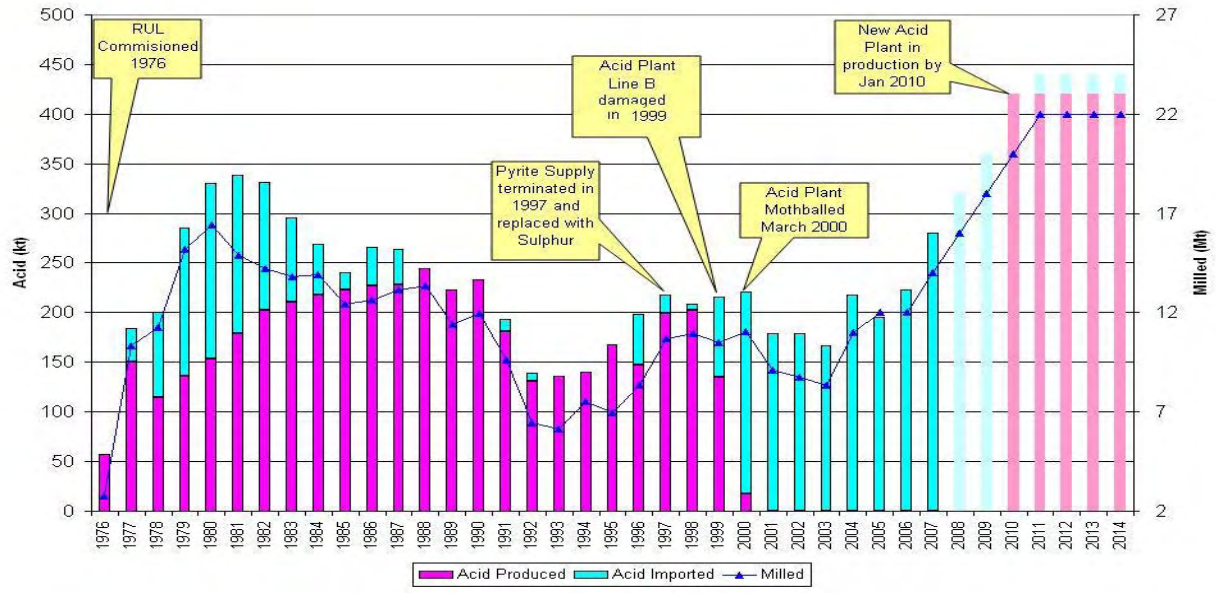


Figure 4: Rössing Uranium's acid production since 1976[9]

The sulphur will be transported from Walvis Bay to the mine site in approximately 12 railcars, each of 50 t capacity, that can be securely closed and thus limit the risk of spillage. There is an existing railway line between Walvis Bay and the mine which is currently used for transporting sulphuric acid to the mine. Five trains per week are envisaged, delivering 600 t each, thus allowing for the 400 t per day required by the acid plant. Up to 10 000 t of sulphur may be stockpiled at the mine, allowing for a supply period of 25 days. The elemental sulphur would need to be imported in bulk via the Port of Walvis Bay and a sulphur handling facility would thus be required in the port.

The Proposed Sulphur Handling Facility in Walvis Bay

An overview of the activities associated with the proposed sulphur handling in the port of Walvis Bay is presented in Figure 5 below, and is described in greater detail under the respective headings to follow.

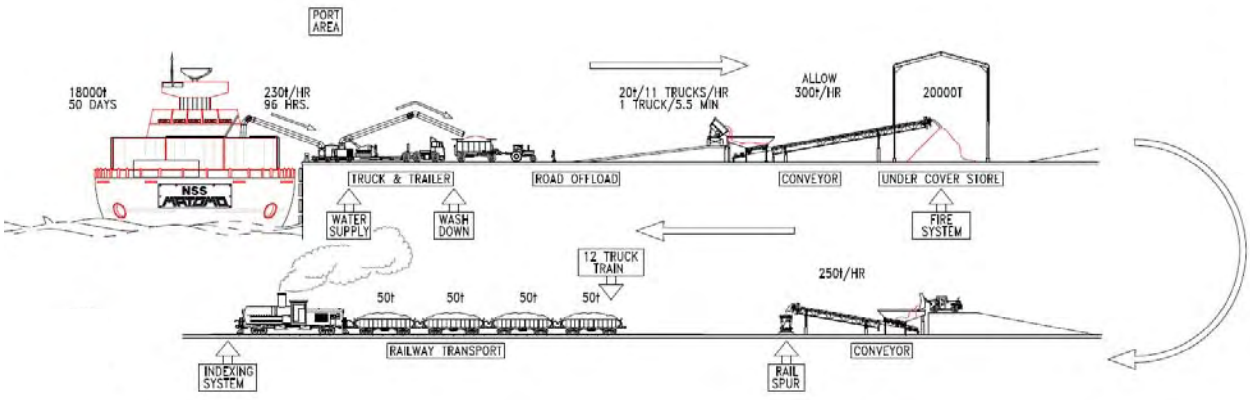


Figure 5: Overview of the Proposed Sulphur Handling Operations in the Port[10]

[9] Source: Rio Tinto Rössing Uranium Limited, 2008

[10] Source: Modified from Matomo Projects. Rössing Uranium Sulphur Handling. Drawing No: 2600/018-P1-000-001-0-0D (draft). 2008

Shipping of Sulphur

As described, Rössing Uranium's need for sulphuric acid in the metallurgical beneficiation process at the mine requires that elemental sulphur would have to be imported via the Port of Walvis Bay. The elemental sulphur would be shipped in the form of "prills", i.e. small, compressed generally spherical pellets, an example of which is provided in Figure 6. Shipping of elemental sulphur in prill form offers a number of environmental and safety benefits in that the generation and mobilisation of sulphur dust is greatly reduced, when compared to shipping it in a powdered form. The sulphur prills are also degassed by the supplier to remove excess sulphur dioxide (SO_2) and hydrogen sulphide (H_2S) which are toxic and can become corrosive under certain conditions, posing a risk to both equipment and personnel. The sulphur prills may also be treated with a biocide to prevent the biodegradation of the sulphur during transit, which could result in the formation and release of toxic and corrosive sulphur derivatives, such as SO_2 and H_2S. The supply ships would need to dock at the Walvis Bay Bulk Terminal (WBBT), which is currently leased and operated by Grindrod, and is located behind berths 7 and 8 in the port. To reduce demurrage costs, ship offloading operations are likely to be run 24 hours a day for the period required to unload the vessel. On this basis, it is estimated that it would take approximately four days to complete the unloading of a supply ship, which will return every 50 days.

Figure 6: Elemental sulphur in prill form[11]

Figure 7: Mobile Siwertell ship unloader[12]

Ship to Storage Shed

The preferred option for unloading of sulphur from ship to quayside would entail the use of a truck-mounted Siwertell continuous ship unloader, as seen in Figure 7, which would lift the sulphur prills from the ship's hold using a continuous screw and place it directly into the trailer of an awaiting tractor trailer.

The unloaded sulphur will then be transported from the quayside to an estimated 3,000m^2 storage shed, where it will remain in stockpile until final transportation to the mine by rail. The preferred method for the transport of sulphur from the quayside to the storage shed entails the use of covered tractor-drawn side-tipping trailers, as seen in Figure 8. These tractors will receive the sulphur directly from the mobile Siwertell and, once loaded, will be covered and will drive the short haul distance to the storage shed. To ensure an efficient, continuous offloading operation, at least two side-tipping trailers will be required.

[11] Source: www.sulphur.com.au/products.html
[12] Source: Rio Tinto Rössing Uranium Limited, 2008

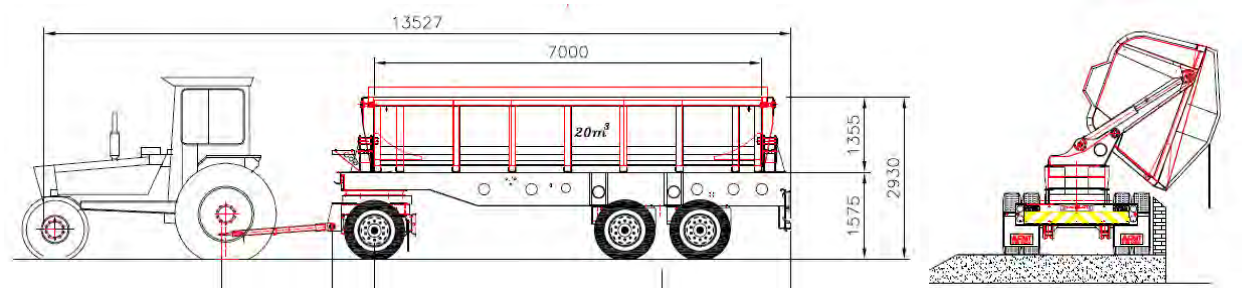


Figure 8: Side-tipping tractor-drawn trailer[13]

The route to be used by the tractors will be determined by the final positioning of the sulphur storage shed. Rössing Uranium will need to consider and discuss the use of these routes and the potential implications for other port activities with NamPort and other stakeholders during the finalisation of the position of the storage shed. Depending on the siting and the aforementioned discussions with NamPort and other stakeholders, Rössing Uranium may be required install or make modifications to the road network to accommodate the transport of sulphur within the port.

The Storage Shed

The port storage area is likely to comprise of a mild steel frame and fibre-cement sheeting enclosed storage shed with a concrete floor, similar to those in use elsewhere in the port. An example of an existing and similar sulphur storage facility is seen in Figure 9. The storage shed would need to be approximately 3,000m^2 in extent, which would be sufficient to house 20,000 t of sulphur in a single stockpile. Sulphur will be placed in stockpile with the use of an extendable conveyor, as depicted in Figure 10. Sulphur handling, reclamation and management of the stockpile in the storage shed would be carried out using rubber-tired front-end loaders.

Despite perceptions to the contrary, elemental sulphur is essentially non-toxic. Sulphur dust does, however, present a hazard in that at high airborne concentrations in an enclosed area, the potential for a dust explosion exists. To manage this risk, dust which may be generated in the handling processes would be controlled by the use of fine water sprays. The sprays would be installed at transfer points in the materials handling system, such as in conveyor chutes and bins. Fire protection systems would entail the use of infra-red heat detection that would be installed in the storage shed to immediately detect the ignition of a sulphur fire and automatically initiate fire suppression measures. The fire fighting system would consist of water reticulation lines and automatic sprinklers located at strategic locations throughout the storage facility. Areas not covered by the sprinkler system, such as the conveyor belts, will be equipped with handheld fire extinguishers. Environmental bunding, wash down and drainage collection systems would be installed throughout the facility to collect potentially contaminated water and direct it to the treatment plant.

[13] Source: Rio Tinto Rössing Uranium Limited, 2008.

Figure 9: Typical enclosed sulphur storage shed[14]

Figure 10: Extendable conveyor for sulphur stockpiling[15]

Storage Shed to Rail

The sulphur stockpile will then be steadily reclaimed and transported by TransNamib via railway to the mine. To meet the demand for the acid production at the mine, it is estimated that five trains per week, comprising 12 hopper wagon railcars of 50 t capacity each, will need to make the journey between the port and the mine. The sulphur will be reclaimed from the port storage shed stockpile by rubber-tired front-end-loader, and loaded into a receiving hopper inside the shed which feeds a fixed loading conveyor and finally the loading bin mounted above the railway line, under which the railcars are shunted (refer back to Figure 5). A typical hopper wagon rail car, similar to those being proposed is depicted in Figure 11.

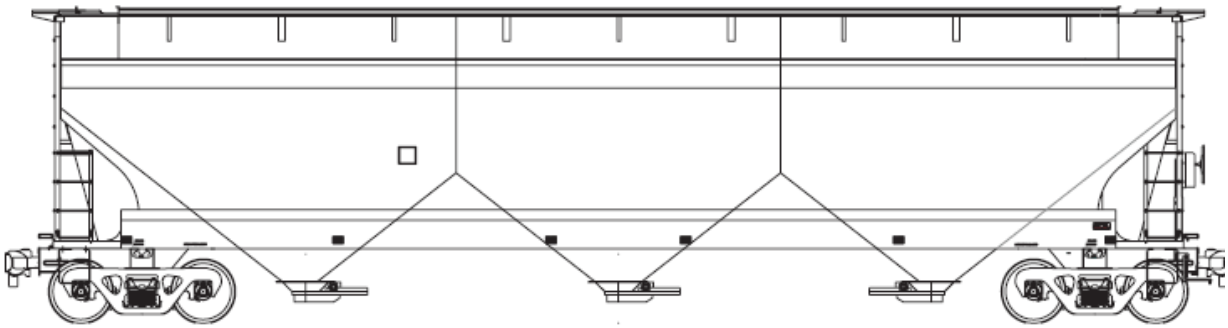


Figure 11: Drawing of a typical hopper wagon[16]

Consideration of alternatives

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[17], as a step in the earliest proposal development stage.

Alternatives are typically considered at various stages in the formulation of proposed developmental policies, plans and projects. With reference to development policies and plans, these are usually addressed at the higher level of national and regional strategy and forward-planning, and are termed strategic alternatives. As far as project alternatives are concerned, their assessment is limited to the level of the site of the particular project. The examination of alternatives for Rössing Uranium's sulphur

[14] Source: Rio Tinto Rössing Uranium Limited, 2008.
[15] Source: www.thor-global.com/products.php?prod=thorstack2
[16] Source: www.worldtraderef.com/WTR_site/Rail_Cars/Guide_to_Rail_Cars.asp
[17] See Section 3 of Appendix A of the policy.

handling facility in the Port of Walvis Bay is thus only concerned with the assessment of project-level alternatives. Unless there are valid and logical justifications to screen out an alternative, all feasible alternatives should be considered in the SEIA Report stage.

During the present SEIA Report stage, each of the selected alternatives has been 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, Rössing Uranium would be able to consider the assessment of the alternatives described in this section with any mitigation measures that are proposed, and select the preferred option for submission to MET:DEA for their clearance.

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 under "Policy framework", the Constitution of the Republic of Namibia, Vision 2030, the Environmental Management Act and Rössing Uranium's Sustainability Assessment provide the overarching policy and planning framework within which Rössing Uranium'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, which includes assessment against social and environmental criteria.

There is also a requirement in terms of environmental best practice to examine the alternative of maintaining the *status quo*. This refers to the situation that would pertain if no development were to occur. In the case of the sulphur handling facility, this option would amount to Rössing Uranium continuing to import liquid sulphuric acid via the Port of Walvis Bay and railing it to the mine until the previously scheduled mine closure in 2016. With the 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 unattractive alternative. Furthermore, the handling and transport of sulphur in its elemental form, as opposed to sulphuric acid in liquid form, generally lessens the environmental, health and safety risks. As a result, the *status quo* alternative is not being evaluated at the same level of comparative detail as the project alternatives reflected in this report are. Rather, the *status quo* forms the baseline against which potential positive and negative social and environmental impacts of Rössing Uranium's proposed expansion project is assessed.

Site alternatives

During the conceptual phase of the proposed project, NamPort indicated that Rössing Uranium would need to make use of the Walvis Bay Bulk Terminal (WBBT) for the receipt of bulk shipments of sulphur into the port. This resulted in Rössing Uranium initiating discussions in mid-2007 with Grindrod, who currently lease and operate the WBBT facility. The WBBT facility is located immediately inland of berths 7 and 8, but has recently expanded with Grindrod's acquisition of a lease over Bulk 1 area, which was intended to provide alternative locations for the sulphur handling facility, as depicted in Figure 12: Port layout. As discussions between Rössing Uranium and Grindrod progressed, it was agreed that Rössing Uranium would pursue the design specifications whilst Grindrod would undertake the environmental assessment process for the proposed facility. However, disparities between the organisations with regard to their approach to Health, Safety and Environmental (HSE) management, as well as supply risk issues associated with the facility, resulted in Rössing Uranium electing to launch their own investigation into alternative options, which has culminated in the present SEIA process.

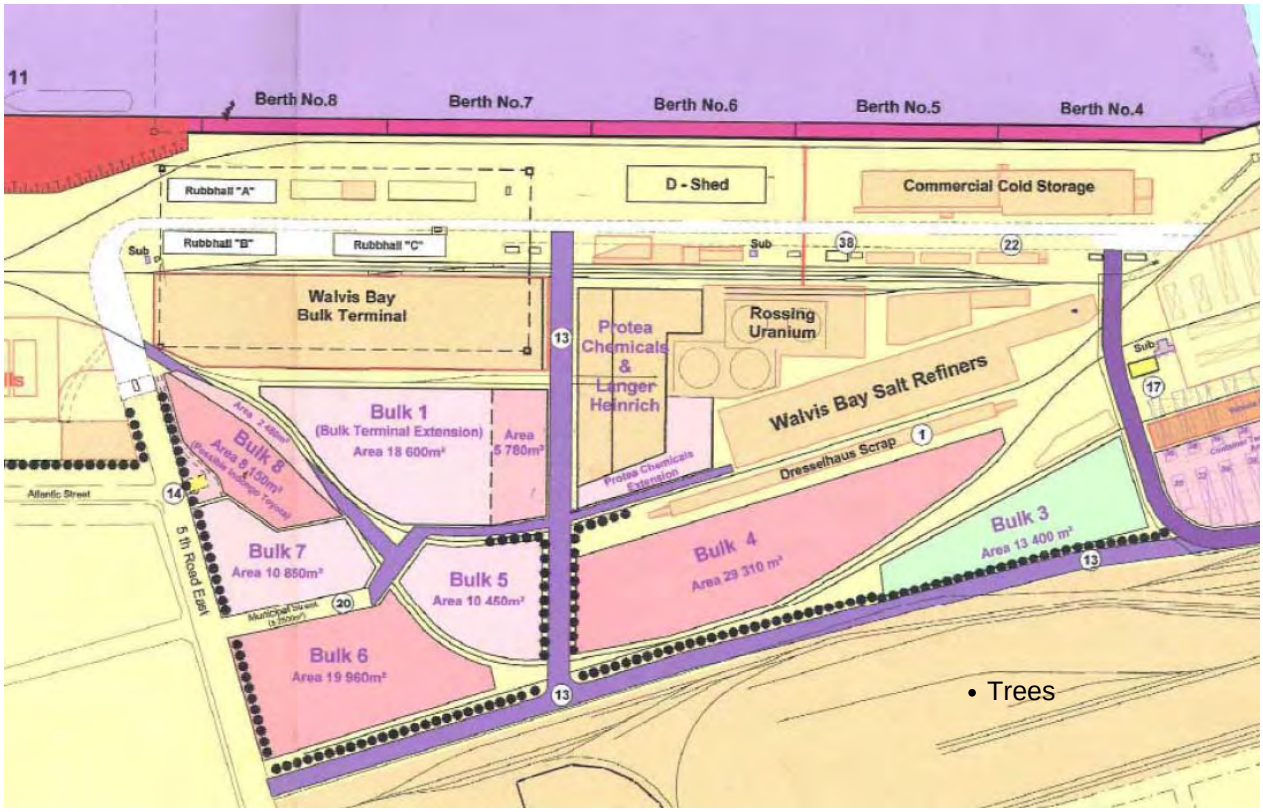


Figure 12: Port layout[18]

Positioning of the sulphur handling facility presents a challenge in that space availability in the port precinct is at a premium. The majority of the area is currently in use and the majority of the remainder of the area is leased by other entities that have or are actively pursuing plans for the use or development of such space. Considering the influencing factors of distance from the storage shed to the ship docking area, distance from the railway, spatial requirements for the shed itself and land tenure issues, three potential locations emerged in addition to that identified by Grindrod.

Grindrod is currently undertaking an environmental assessment to have the sulphur storage positioned at the area denoted as Option A in Figure 13. This SEIA is assessing the same type of facility and associated activities albeit positioned at Options B, C or D in Figure 13. Naturally, the transport routes between the WBBT, the storage shed and the rail loading station would also vary according to the final siting. It is important to note that only one sulphur handling facility is to be built, despite separate environmental assessments being undertaken by different proponents. This is due to Rössing Uranium having identified additional potential locations for the facility, who wanted to assess the suitability of these additional locations which fell outside the scope of the Grindrod assessment.

[18] Source: Rössing Uranium Limited. 2008

Figure 13: Site alternatives for the sulphur handling facility in Walvis Bay[19] and overlay with Figure 12: Port layout for comparison purposes

[19] Source: Rössing Uranium / Aurecon Public Information Document

All the site options are located within the heavy industrial area of the port and have all been severely altered, i.e. are considered brownfield sites, as can be seen in Figure 14. As a result, there is little differentiation between the sites in terms of biophysical criteria and the key drivers in the identification a preferred site are premised on the cost, functional benefits and drawbacks presented by the different options.

Figure 14: General view toward the WBBT area in the port

The various sites have been assessed by Rössing Uranium from a technical and economic optimisation perspective, insofar as the human health, engineering cost and infrastructure integration are concerned. The outcome of this assessment was that site Option D, which is located seaward of the existing Rössing Uranium sulphuric acid tank farm and the Walvis Bay Salt Refiners' salt stockpiles and the railway line, has been identified as the preferred alternative siting option. The siting for the sulphur storage shed is denoted by Option D in Figure 13 and a more detailed layout drawing of this option is provided in Figure 15, below. This transpired as result of the location being in close proximity to both the quayside and existing, usable railway lines.

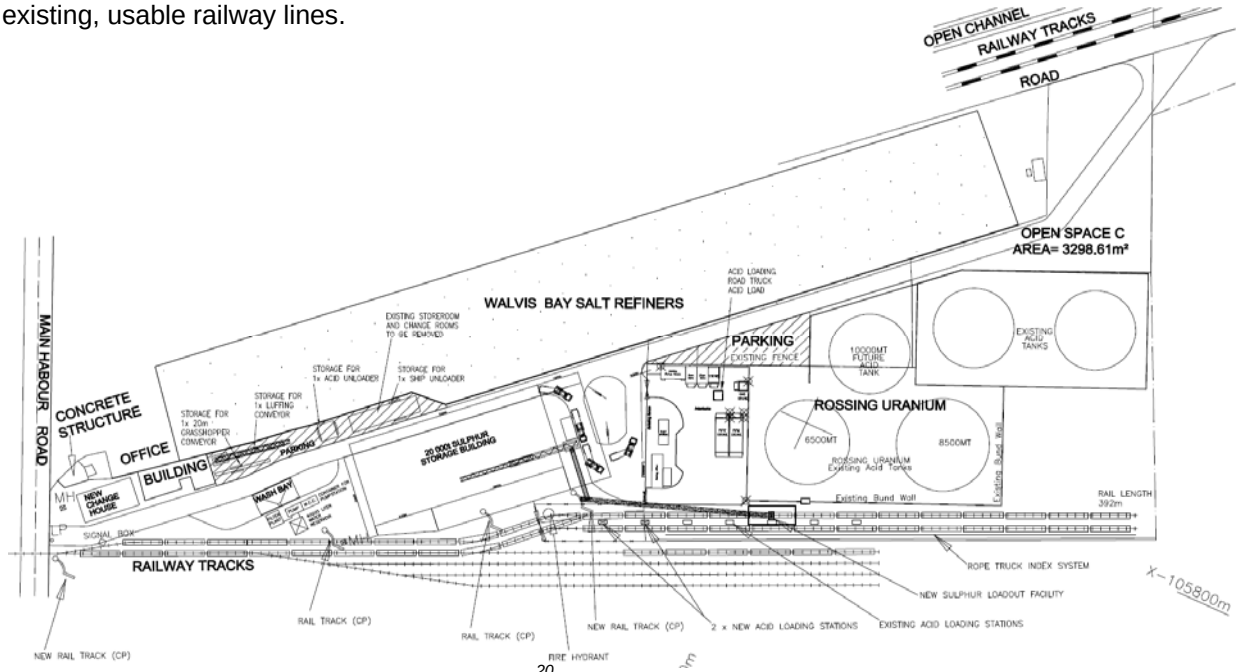


Figure 15: Sulphur storage shed located at site Option D[20]

[20] Source: Modified from Matomo Projects. Rössing Uranium Sulphur Handling. Drawing No: 2600/018-L1-000-004-01-0F (draft). 2008

Handling, storage and transport alternatives

Similarly to the siting of the sulphur handing facility, alternative transport methodologies and technologies do not vary greatly in impact significance. Consequently, the primary drivers in the selection of a suitable alterative are premised on realising economic and operational efficiencies without causing undue negative impact on the socioeconomic environment. Potential alternative equipment and operational methodologies considered during the conceptual design phase for the handling, storage and transport are presented in Table 1, below. Note that certain alternatives in the table are not compatible with other alternatives and thus some may be default with the selection of other alternatives. The column titled 'Alternatives 1' summarises the preferred alternative.

Table 1: Handling, storage and transport alternatives considered

ASPECT	ALTERNATIVES 1	ALTERNATIVES 2	ALTERNATIVES 3	ALTERNATIVES 4
Unloading sulphur from the ship	Small, Truck mounted Siwertell	Mobile crane and grab system	Siwertell continuous ship unloader	N / A
Loading for transport on quayside	Side-tipping truck/tractor drawn trailer	Siwetell integrated covered conveyor	Mobile hopper onto a quayside trough conveyor	N / A
Transport from Quayside to Storage Shed	Side-tipping truck / tractor drawn trailer	Pipe conveyor	Trough conveyers with dog house and spill trays	N / A
Storage shed structure	20 kt rectangular shed with Fibre-cement cladding	20 kt Rectangular shed, enclosed with fabric (Extendable conveyor)	Monolithic dome	36 kt rectangular, fabric enclosed shed (Tripper conveyor)
Stockpiling in the shed	Extendable conveyor	Front end loader or similar small earth moving equipment	Top loaded using an internal spiral chute (Monolithic dome)	Tripper conveyor
Reclaiming stockpile for transport to Rössing Uranium	Front end loader to hopper	Gravity reclaim using "moving hole" technology	Front end loader to containers	N / A
Loading of rail wagons	Fixed conveyor with weigh bins	Hopper feeds telescopic conveyor which feeds rail wagons	Radial conveyor with belt scale	Forklift containers to flatbed rail car
Rail wagon design	Hopper wagons	Side tipping wagons	Flatbed railcar with tilting bed off loader	N / A

Summary of the preferred alternative

Table 2 provides a summary of the preferred alternative together with the primary motivations for the preference of the respective alternative.

Table 2: Summary of the preferred alternative

ASPECT	PREFERRED OPTION	PRIMARY MOTIVATIONS
Unloading sulphur from the ship	Small, truck-mounted Siwertell	Cost, structural integrity of the berth, opportunity to share infrastructure and equipment
Loading for transport on quayside	Side-tipping truck / tractor drawn trailer	Cost, diminished access issues associated with fixed conveyor belts, opportunity to share infrastructure and equipment
Transport from Quayside to Storage Shed	Side-tipping truck / tractor drawn trailer	Cost, diminished access issues associated with fixed conveyor belts, opportunity to share infrastructure and equipment
Storage Shed Location	Option D	Under Rössing Uranium control, easy access and short haulage to both quayside and rail
Storage shed structure	20 kt rectangular, Fibre-cement shed with concrete floor	Cost, sulphur dust control and fire protection (Health, safety and Environment)
Stockpiling in the shed	Extendable conveyor	Cost

Reclaiming stockpile for transport to Rössing Uranium	Front end loader to shipping containers	Cost, no need for purpose-designed railway cars, opportunity to share infrastructure and equipment
Loading of rail wagons	Fixed conveyor with weigh bins	Rapid loading of railcars, less complicated and expensive variety of conveyor system
Railcar design	Hopper wagons (bottom tipping rail cars)	Zero-spill design, quicker turn around times due to rapid offloading

Potential impacts identified during the scoping stage

One of the main purposes of the SEIA process is to understand the significance of the potential impacts associated with the sulphur handling facility and its associated activities and infrastructure, and to determine if the available project alternatives are potentially more beneficial to the socio-economic and biophysical environment. A further objective of the SEIA is to determine if the potential impacts associated with the activity can be minimised or mitigated. This section of the SEIA Report identifies the range of potential impacts. It should be noted that the identification of the impacts described in the sections to follow emerged as concerns from the stakeholders, as well as input from the project team and Rössing Uranium personnel.

Construction phase impacts

These are impacts on the socio-economic and biophysical environment that would occur during the construction phases of the proposed sulphur handling facility in the Port of Walvis Bay. They are inherently temporary in duration, but may have longer-lasting effects. Construction phase impacts could potentially include:

- The extent of employment opportunities created as a consequence of the proposed developments, both for permanent and contracted workers;
- Impacts on water resources, namely groundwater;
- Interference with current commercial activities in the port in the vicinity of the construction site;
- Management of materials required for construction or establishment;
- Increase in traffic volumes to the port and in the vicinity of the construction sites;
- Windblown dust;
- Interference with train movements in the port area during the extension of the railway lines;
- Noise pollution and vibration; and
- Pollution from construction waste and other contaminants.

Based on the temporary duration of the construction phase and the fact that negative impacts of construction can, in general, be reliably predicted and mitigated, more attention is given to the operational phase impacts of the proposed sulphur handling facility than to the construction phase impacts. Moreover, the construction phase impacts related to the sulphur handling facility are assessed as being of low significance. These construction-related impacts can easily be accommodated within a Social and Environmental Management Plan (SEMP), industry norms and standards and Rössing Uranium's own best practice.

It should be noted that a construction phase SEMP in draft form has been developed and its implementation will regulate and minimise the impacts during the construction phase. This construction specification SEMP has been developed as part of the SEIA Report phase and is included as Annexure B.

Operational phase impacts

Given their long term nature, operational phase impacts are given closer scrutiny in the SEIA stage of this assessment process. Impacts detailed in this section are effectively prompted by the stakeholder meeting held in Walvis Bay on 7 February 2008, public input on the Scoping Report and input from the project team, Rössing Uranium personnel and other stakeholders. Specialist studies have identified and

assessed the implications of the key impacts and have included measures to minimise predicted impacts. The assessment of potential impacts will help to inform Rössing Uranium'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, contained in this SEIA Report. The potential operational phase issues associated with the bulk storage and handling of sulphur in the port area includes:

- Permanent employment creation;
- The risk of sulphur fires and explosions in the storage shed and the potential impact of such an occurrence on the environment;
- The human health and environmental hazard associated with elemental sulphur as a pollutant:
  - The health, safety and environmental risk associated with a spillage of sulphur during its handling and transport in both the port area and in the public domain;
  - The generation and release of sulphur dust into the surroundings and the potential impact on human health and the biophysical environment; and
  - The risk posed by sulphur residue on handling equipment and how this will be managed;
- The potential increase in noise and vibration and the associated impact on the nearby residential areas;
- The potential visual impact of the proposed sulphur handling shed;
- The lack of space in the port to accommodate the proposed facility and the potential negative impacts on existing economic activities in the port;
- The impact, management and risk associated with potential train accidents at railroad crossings;
- The risk of other commodities stored in the port being contaminated by elemental sulphur; and
- The control and treatment of sulphur contaminated water from the storage facility.

It is normal practice that, should the proposed sulphur handling facility 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 have been informed by the mitigation measures that have emerged from the SEIA process. A preliminary SEMP is attached as Annexure B.

THE PUBLIC PARTICIPATION PROCESS

The purpose of this chapter is to describe the public participation undertaken to date, i.e. during the preceding Scoping Stage, to present a synopsis of the issues raised, Interest and Affected Parties (I&APs) and stakeholders identified, and the participation opportunities related to the SEIA Stage. It also provides an indication of the way forward with the public participation process.

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 have an opportunity during SEIA process to gain more knowledge about the proposed project, to provide input and to voice any issues of concern.

Stakeholders were given opportunity 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 the stakeholders, as derived from the stakeholder feedback meeting minutes provided in Annexure C4 of this SEIA Report:

- The risk of sulphur fires and explosions in the storage shed and the potential impact of such an occurrence to the environment;
- The health, safety and environmental risk associated with a spillage of sulphur during its handling and transport in both the port area and in the general public domain;
- The generation and release of sulphur dust into the surroundings and the potential impact on human health and the biophysical environment;
- The risk posed by sulphur residue on handling equipment and how this will be managed;
- The potential increase in noise and vibration and the associated impact on the nearby residential areas;
- The lack of space in the port to accommodate the proposed facility and the potential negative impacts on existing economic activities in the port;
- The impact, management and risk associated with potential train accidents at railroad crossings;
- The risk of other commodities stored in the port being contaminated by elemental sulphur; and
- The control and treatment of sulphur-contaminated water from the storage facility.

The objectives of public participation are being 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.

Identification of stakeholders

The stakeholder groups were identified during the Scoping Stage as the key ones to be consulted throughout the assessment process, they are listed in Table 3 below:

Table 3: Identified stakeholders

Surname	Initial	Representing
Amedick	M	Walvis Bay Municipality
Archer	R	Walvis Bay Municipality
Arnold	J	Namsov Fishing Enterprises (Pty) Limited
Asino	K	Walvis Bay Municipality
Braby	R	Nacoma
Brummer	A	Walvis Bay Municipality
Burger	A.	Walvis Bay Municipality
Dempsey	J	TransNamib
Dreyer	D	Walvis Bay Municipality
Eiman	T	NamPort
Engelbrecht	E	Wesbank Transport
Ferreira	J	Walvis Bay Bulk Terminal
Grinyer	C	Grindrod
Hans-Werner	T	Manica Group Namibia (Pty) Ltd
Kathindi	A	NamPort
Kearns	M	Protea Chemicals
Kruger	G	Walvis Bay Municipality
Küsters	R	Grinrod
Leippert	M	Coastal Tourism Association
Mouton	J	NamPort
Mwenyo	E	NamPort
Nicholas	J	TransNamib
Oelerman	L	Oyster Farmers Association
Olivier	J	Protea Chemicals
Palomba	M	Protea Chemicals
Raw	T	NamPort
Sebby	K	NamPort
Stanton	R	Walvis Bay Salt Refineries
Steenkamp	P	Grinrod
Timke	HW	Manica Group Namibia (Pty) Ltd
Uushona	D	Walvis Bay Municipality
van der Walt	V	Wesbank Transport
van Rooyen	M	Wesbank Transport
van Wyk	M	TransNamib
Venter	W	Commercial Cold Storage (Namibia) (Pty) Ltd
Victor	T	Walvis Bay Municipality
Visagie	R	NamPort
Wearne	K	Coastal and Environmental Trust of Namibia
Wilson	B	Unknown
Wolff	T	WB Stevedoring
Yates	M	ASEC

Public participation during the Scoping Stage

The identified stakeholders listed in the previous section were sent an invitation, a copy of which appears as Annexure C1, to attend a focus group meeting that was held on 7 February 2008 in Walvis Bay. They were also sent Public Information Documents (PIDs), as appear as Annexures C2 and C3, aimed at informing I&APs and stakeholders about the proposed development by Rössing Uranium and to promote participation in the SEIA process.

Eighteen stakeholders attended the focus group meeting held on 7 February 2008 and their details are provided in Table 4. The meeting was co-ordinated by Marie Hoadley, the public participation manager for the SEIA process, and three delegated representatives from Rössing Uranium were present to respond to queries and provide insight into the technical workings of the proposed project and Rössing Uranium's operations at large.

Table 4: Focus group meeting attendance register (7 February 2008)

NAME	ORGANISATION
Andre Burger	Walvis Bay Municipality
Kaspur Shimochki	Walvis Bay Municipality
Verdun van der Walt	Wesbank Transport
Susan Roux	CETN
Jakobus Olivier	PMC
Elias Mwenyo	NamPort
Michelle Yates	ASEC
Rob Braby	Nacoma
J Kongumba	TransNamib
Thomas Wolff	WBS
W Venter	Commercial Cold Storage (Namibia) (Pty) Ltd
Hans Werner Timke	Manica Group
Deville Dreyer	Walvis Bay Municipality
Raymond Visagie	NamPort
Johnny Ferreira	Walvis Bay Bulk Terminal
Tim Eiman	NamPort
Keith Wearne	CETN
D Uushona	Walvis Bay Municipality
MEETING CO-ORDINATORS	
Rainer Schneeweiss	Rössing Uranium
Dave Garrard	Rössing Uranium
Svenja Garrard	Rössing Uranium
Marie Hoadley	Public Participation Practitioner

The issues and comments raised by the stakeholders as well as the responses thereto by the meeting co-ordinator or Rössing Uranium representatives were recorded and can be viewed in Annexure C4 of this report.

Public participation during the SEIA Stage

During the SEIA Stage of the process, public participation will comprise the following:

- Ongoing registration of and engagement with stakeholders who have, subsequent to the Scoping Stage, expressed an interest in the participation process;
- Presenting the findings of the Draft SEIA Report to identified stakeholders and the public at large;

- Recording stakeholder and I&AP issues, comments and any corresponding responses; and
- Investigating issues at greater depth where the need for this has been indicated.

All the identified stakeholders will be notified by way of letter of the availability of the Draft SEIA Report, the locations where the report can be viewed and the date by which any comments they may have must be returned. Concurrently, newspaper adverts will be commissioned to notify the public of the same. Copies of this Draft SEIA report will be lodged for public viewing at the library in Walvis Bay and in Namibia's National library in Windhoek, as well as being placed on Rössing Uranium's and Aurecon's websites.

Comments and issues received from the I&APs and stakeholders will then be captured, considered and responded to during the finalisation of the SEIA Report for final submission to MET:DEA.

Post-submission public involvement and appeals

Should MET:DEA believe that the final submission contains sufficient information to allow for sound decision-making, they will consider issuing a clearance for the project. Such clearance may include certain conditions, e.g. the undertaking of environmental controls as stipulated in the SEMP that accompanies this SEIA Report.

All registered I&APs and stakeholders will be informed of MET:DEA's decision once it is made available and in the event that an I&AP or stakeholder wishes to appeal the decision, details regarding the appeal process will also be furnished.

ASSESSMENT METHODOLOGY

The purpose of this chapter is to describe the assessment methodology utilised in determining the significance of the construction and operational impacts of the proposed sulphur handling and storage facility in the Port of Walvis Bay on the socio-economic and biophysical environment. It also addresses the challenge of subjectivity and the means of assessing cumulative impacts.

Assessment methodology

A standardised and internationally recognised methodology[21] has been applied to assess the significance of the potential environmental impacts of Rössing Uranium's expansion project, outlined as follows:

For each impact, the EXTENT (spatial scale), MAGNITUDE (size or degree scale) and DURATION (time scale) are 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 decision as to which combination of alternatives and mitigation measures to apply for lies with Rössing Uranium as the proponent, and their acceptance and approval ultimately with MET:DEA. The tables on the following pages show the scale used to assess these variables, and defines each of the rating categories.

Table 5: Assessment criteria for the evaluation of impacts

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	**National**	Within Namibia
	Regional	Within the Erongo Region
	Local	On site or within 1000 m of the impact site
Magnitude of impact (at the indicated spatial scale)	**High**	Social and/or natural functions and/ or processes are *severely* altered
	Medium	Social and/or natural functions and/ or processes are *notably* altered
	Low	Social and/or natural functions and/ or processes are *slightly* altered
	Very Low	Social and/or natural functions and/ or processes are *negligibly* altered
	Zero	Social and/or natural functions and/ or processes remain *unaltered*
Duration of impact	**Short term**	Up to 7 years
	Medium Term	Up to 10 years after construction
	Long Term	More than 10 years after construction

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and magnitude. Such significance is also informed by the context of the impact, i.e. the character and identity of the receptor of the impact. The means of arriving at the different significance ratings is explained in the following table, developed by Aurecon in 1995 as a means of minimising subjectivity in such evaluations, i.e. to allow for replicability in the determination of significance.

[21] As described, *inter alia*, in the South African Department of Environmental Affairs and Tourism's Integrated Environmental Management Information Series (Government of SA, 2002).

Table 6: Definition of significance ratings

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

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 has been 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.

Table 7: Definition of probability ratings

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

Table 8: Definition of confidence ratings

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

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

Table 9: Definition of reversibility ratings

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

Subjectivity in assigning significance

Despite attempts at providing a completely objective and impartial assessment of the environmental implications of development activities, environmental assessment processes can never escape the subjectivity inherent in attempting to define significance. The determination of the significance of an impact depends on both the context (spatial scale and temporal duration) and intensity of such an impact. Since the rationalisation of context and intensity will ultimately be prejudiced by the observer, there can be no wholly objective measure by which to judge the components of significance, let alone how they are integrated into a single comparable measure.

This notwithstanding, in order to facilitate informed decision-making, environmental assessments must endeavour to come to terms with the significance of the potential environmental impacts associated with particular development activities. Recognising this, Aurecon has attempted to address potential subjectivity in the current SEIA process as follows:

- Being explicit about the difficulty of being completely objective in the determination of significance, as outlined above;
- Developing an explicit methodology for assigning significance to impacts and outlining this methodology in detail. Having an explicit methodology not only forces the assessor to come to terms with the various facets contributing towards the determination of significance, thereby avoiding arbitrary assignment, but also provides the reader of the SEIA Report with a clear summary of how the assessor derived the assigned significance;
- Wherever possible, differentiating between the likely significance of potential environmental impacts as experienced by the various affected parties; and
- Utilising a team approach and internal review of the assessment to facilitate a more rigorous and defendable system.

Although these measures may not totally eliminate subjectivity, they provide an explicit context within which to review the assessment of impacts.

Consideration of cumulative impacts

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

- Cumulative effects may be local, regional or global in scale and dealing with such impacts requires co-ordinated institutional arrangements; and
- Environmental assessments are typically carried out on specific developments, whereas cumulative impacts result from broader biophysical, social and economic considerations, which typically cannot be addressed at the project level.

However, when assessing the significance of the project level impacts in the next chapter, cumulative effects have been considered as far as it is possible in striving for best practice.

ASSESSMENT OF POTENTIAL IMPACTS AND POSSIBLE MITIGATION MEASURES

This chapter forms the focus of the SEIA process. It contains a detailed assessment of the operational (or long-term) impacts as well as the construction phase impacts on the affected socio-economic and biophysical environment, using the methodology described in the previous chapter.

Introduction

Under the heading "Potential impacts identified during the scoping stage" the potential impacts on the socio-economic and biophysical environments which may occur due to the proposed development are described. These include potential impacts which may arise during the operation of the proposed sulphur handling and storage facility in the Port of Walvis Bay, as well as the potential construction related impacts associated with the construction of the facility. From the full range of potential impacts, those that are clearly of minor significance have been screened out, after consideration of the specialist studies and other available information. The impacts identified as significant under "Potential impacts identified during the scoping stage" are assessed in this chapter.

It should be noted that biodiversity impacts as a result of physical displacement are not of concern since all the site options are located in the already severely disturbed areas (brownfield sites) of the industrial zone of the Port of Walvis Bay.

The presentation of the assessments of the identified impacts that follows have been categorised into three categories, namely, the socio-economic environment, human health and wellbeing, and the biophysical environment.

Each of these impacts is assessed in detail and the significance of the impact determined. The methodology used to assess the potential impacts is detailed in the previous chapter of this report. The terms 'No mitigation' and 'Mitigation' reflected in the assessment tables in this chapter refer to the impact with no mitigation and with mitigation respectively, where these are available.

The consideration of the range of project-level alternatives described under "Consideration of alternatives" resulted in a preferred alternative emerging. Table 2 provides the motivations for the preferred alternative. The assessment of identified impacts that follows, related to the preferred alternative, is based on determining their social and environmental acceptability after best available technology or appropriate mitigation has been applied.

Operational phase impacts on the socio-economic environment

Permanent employment creation

Description

Namibia, as with most Southern African states, is faced by the problem of poverty, lack of skills and unemployment. New developments such as the sulphur handling facility have the potential to create permanent employment, affect skills development and in so doing reduce poverty, which is regarded as a positive impact.

Quantification

The projected number of permanent Rössing Uranium employees required on a yearly basis until the proposed 2026 mine closure indicates an overall increase over present employment levels of

approximately 700 persons. However, this figure is associated with the entire expansion project of which the sulphur handling facility in the Port of Walvis Bay only forms a small part. Thus, the proposed sulphur handling facility does not represent a significant portion of Rössing Uranium's employment creation, although it should continue to be seen in the context of the larger project. It is estimated that the new sulphur handling facility itself would require a staff compliment of 8 skilled, 2 semi-skilled and 2 unskilled employees.

The operation of the sulphur handling facility would require a small number of predominantly skilled employees, who are not readily found among the unemployed in the region. The bulk of the workforce associated with the facility would comprise machine operators and a fewer number of semi-skilled labour to make up the remainder. It is also likely that the majority of the employees currently operating the existing sulphuric acid tank farm in the port area would be used for the operation of the sulphur handling facility and thus, new employment creation is considered to be minimal.

Due to the small numbers involved and the internal transfer of employees already in Rössing Uranium's employ, the impact of employment creation associated with the sulphur handling facility alone would be limited to the local level.

The magnitude of the impact of the sulphur handling facility is regarded as very low since there would be a negligible alteration in employment levels and economic activity. The duration of the impact is regarded as long term, given the 2026 time horizon for the life of the mine during which the sulphur handling facility would remain in operation. The probability of it occurring is definite and the impact is entirely reversible if conditions should change.

The significance of permanent employment opportunities is therefore regarded as a very low positive impact. Notwithstanding the long term nature of the impact, intervention (mitigation) would be necessary to maximise the benefits beyond mine closure.

Mitigation

To further enhance the positive benefits of this impact, it is suggested that on-going training and skills enhancement programmes applied throughout Rössing Uranium are extended to the sulphur handling facility staff compliment, which could have an effect beyond the proposed mine closure in 2026[22]. People thus trained will be better equipped for employment elsewhere or for self-employment. Maximising the training opportunities suggested for the construction phase may also allow less skilled local people to access permanent employment, to the benefit of the operational phase of the project. If these mitigation measures are applied, the significance of this impact would be elevated to a low positive one, as a consequence of the magnitude becoming low, i.e. a resulting slight alteration in employment levels and economic activity.

[22] It is recognised that Rössing Uranium has extensive training and support programmes already in place, which could form the basis for the enhanced training being suggested.

Conclusion

The following table is a summary of the impact assessment for this potential impact, both with and without the recommended mitigation measures in place.

Impact on permanent employment creation

	No mitigation	Mitigation
Extent	Local	Local
Magnitude	Very low	Low
Duration	Long term	Long term
SIGNIFICANCE	Very low (+)	Low (+)
Probability	Definite	Probable
Confidence	Certain	Certain
Reversibility	Reversible	Reversible

Impact on worker health and safety in a sulphurous work environment

Description

Workers in the facility will be exposed to elemental sulphur on an ongoing basis through skin contact and the possible inhalation of sulphur dust which could potentially result in adverse health implications.

Quantification

The following quantification of this potential impact is an extract from the specialist report by Infotox (Pty) Ltd which is provided as Annexure D1 of this Draft SEIA Report.

> *Sulphur is known to be of low toxicity and poses very little, if any, risk to human and animal health. Short-term studies have shown that elemental sulphur is of very low acute oral toxicity and does not irritate the skin. The United States Environmental Protection Agency (USEPA) has placed it in its Toxicity Category IV, the least toxic category for these effects. Sulphur also is not a skin sensitiser, but it may cause some eye irritation. An individual may be exposed for several hours or days to sulphur dust (at relatively high concentrations) before a sensation of scratchy discomfort in the eyes is developed. This may then progress to burning and tearing, with blurring of vision. In these cases there may be loss of patches of corneal epithelium with no evident abnormality of the deeper layers of the cornea. Recovery is spontaneous and complete within two or three days when exposure is discontinued (Grant, 1986).*
>
> *The respiratory health effects of elemental sulphur are not well documented. Acute exposure to large amounts of elemental sulphur through inhalation may cause catarrhal inflammation of the nasal mucosa, which may lead to hyperplasia with abundant nasal secretions. Trachiobronchitis may occur, with dyspnea, persistent cough and expectoration.*
>
> *Chronic exposure to elemental sulphur at environmental levels is generally recognised as a low risk to adverse health effects. Prolonged inhalation of sulphur dust in the occupational setting may cause irritation of the respiratory tract and may aggravate asthma and some other pulmonary conditions. However, dose-response data, in particular no-observed-adverse-effect levels (NOAELs) or lowest-observed-adverse-effect levels (LOAELs) are not available to derive health risk-based guideline concentrations for screening of health risks.*
>
> *Exposure to elemental sulphur has not been associated with risks of reproductive, teratogenic or oncogenic or carcinogenic effects in humans and animals. Sulphur has been shown to be non-mutagenic in micro-organisms. No guidelines or standards for chronic or sub-chronic exposure to elemental sulphur have been set by regulatory bodies or public health agencies in the world.*
>
> *There is no recommended human intake of sulphur to maintain optimum health. Acute and chronic oral exposure to elemental sulphur is known to be of low toxicity. It is assumed that human health risk based air concentration limits will also restrict the accumulation of sulphur in house dust, provided that normal household cleaning practices are in place.*

Hand-to-mouth transfer of sulphur in house dust is therefore not considered a threat to the health of infants and small children, if sulphur concentrations in air are within the recommended air limits.

Since elemental sulphur is of low toxicity and ill health affects may only arise from extreme or prolonged exposure or individual sensitivities, the magnitude of the impact is considered to be low. The duration of the impact will be present for the entire life of the facility and thus is considered a long term impact, while its extent would be local. This impact is thus considered to be of low negative significance.

Mitigation

The following mitigation measures have been recommended to limit impacts associated with worker exposure to elemental sulphur:

- As a precautionary measure, concerted efforts should be made to limit sulphur concentrations in the air to below 0.125 mg/m^3 at all times[23];
- Dust control systems such as sprayers should be fitted to transfer points and handling areas, so as to avoid the generation and mobilisation of respirable sulphur dust;
- Protected eating areas are to be provided and not eating is permitted within the main shed to prevent the contamination of food with sulphur and its subsequent ingestion; and
- Workers should be provided with the necessary Personal Protective Equipment (PPE) when coming into direct contact with sulphur.

With these mitigation measures in place, the significance of the impact could reduce to a very low negative, as a consequence of the magnitude reducing to very low, i.e. a resulting negligible alteration in worker exposure to health risks.

Conclusion

The following table is a summary of the impact assessment for this potential impact, both with and without the recommended mitigation measures in place.

Impact on worker health and safety in a sulphurous work environment

	No mitigation	Mitigation
Extent	Local	Local
Magnitude	Low	Very low
Duration	Long term	Long term
SIGNIFICANCE	Low (-)	Low (-)
Probability	Probable	Probable
Confidence	Uncertain	Uncertain
Reversibility	Irreversible	Irreversible

Economic implications of a sulphur fire or explosion

Description

This impact relates to the potential of a sulphur fire or explosion that results in the generation of immense heat and the release of toxic sulphurous fumes that may affect the economic activities in and around the Port of Walvis Bay.

Quantification

In the event of a large sulphur fire or explosion, neighbouring business activities will need to be suspended and the premises evacuated and, depending on wind direction and velocity, businesses further afield in the port or in neighbouring areas may also need to be evacuated until the situation is brought under control. In such an event, these businesses stand to lose production time and possibly

[23] Temporary Emergency Exposure Limits developed by the United States Department of Energy, 2007

capital if the fire spreads. Note that the "no mitigation" situation is not addressed in the table below, since installing the mitigation measures as described would be a statutory requirement and would be undertaken by Rössing Uranium in any event.

Mitigation

Mitigation of this potential impact relates primarily to the prevention of such an occurrence through proper facility design and management, and having the appropriate emergency protocols and systems in place to effectively control fire or explosion with minimal resultant damage. The following mitigations measures are recommended in this instance:

- The facility is to be fitted with the requisite evacuation points to ensure can be efficiently evacuated in the event of a fire;
- Emergency procedures to be followed in the event of a fire should be put in place;
- In addition to the automated fire extinguishing system, manually operated fire fighting resources should be positioned throughout the facility and all personal are to be trained in their use;
- Breathing apparatus for fire fighting purposes shall be kept at the facility so that, in the event of a fire, employees can respond to and extinguish such fires without inhaling toxic fumes;
- Employees should undergo intensive safety induction training to ensure that they are well aware of the dangers associated with sulphur fires and explosions and are aware of the procedures to follow in such an event;
- Additional mitigation measures such as the provision of smoking areas should be included in the SEMP;
- Rössing Uranium must liaise with the port and municipal emergency authorities in formulating a emergency plan in the event of a fire or explosion occurring at the facility. This plan should include an evacuation plan for residential areas that may be upwind of the fire and may be inundated with fumes;
- Rössing Uranium must ensure that an effective access control system is in place that prevents members of the public or other unauthorised persons to enter the facility; and
- Care must be taken to ensure that potential fire hazards and other flammable materials or installations are set back from the sulphur handling facility, so as to prevent a chain reaction industrial fire or explosion from occurring.

With these mitigation measures in place, the extent of the potential impact would be local and its duration short term. The magnitude would, however, be medium, since a notable alteration in social functions and processes may result. This impact is thus regarded as of low negative significance.

Conclusion

The following table summarises the impact assessment for this potential impact, but only with the recommended mitigation measures in place, since the facility would not be allowed to operate without such measures.

Impact on economic environment associated with a sulphur fire or explosion

	No mitigation	Mitigation
Extent	-----	Local
Magnitude	-----	Medium
Duration	-----	Short term
SIGNIFICANCE	-----	Low (-)
Probability	-----	Unlikely
Confidence	-----	Certain
Reversibility	-----	Reversible

Risk to employees in the event of a sulphur fire or explosion

Description

In the event of a fire or explosion in the facility, workers would be at risk and may suffer serious or fatal injury.

Quantification

A sulphur dust explosion could result from the ignition of a volume of dust particles (of a particular size) at a concentration within the flammable range of the substance. It is intended that sulphur would be handled in prilled form and dust would thus only be a consequence of abrasion arising from its handling.

Sulphur is flammable and combusts readily when exposed to heat, sparks, flame or due to chemical reaction with oxidisers. The oxides of sulphur fumes given off by combusting sulphur are highly toxic. Sulphur fire events during storage and processing were examined in the specialist risk assessment study undertaken by Infotox. Besides the risk from toxic sulphur dioxide (SO_2) fumes, burning sulphur would also pose a thermal radiation risk to humans and to structures. Pool fires, i.e. in tanks or bunded areas and usually as a result of leakage or spillage, were also examined.

Through the implementation of the necessary controls, the specialist risk assessment study concluded that the probability of a fire or explosion occurring in the facility is considered to be unlikely. Note that the "no mitigation" situation is not addressed in the table below, since installing the mitigation measures as described would be a statutory requirement and would be undertaken by Rössing Uranium in any event.

Mitigation

The following mitigation measures are required to limit the potential risk to employees in the event of a sulphur fire or explosion:

- Installation of infrared fire detection sensors and automated fire extinguishing sprinklers and alarms;
- Use of low sparking flooring to reduce the occurrence of sparking by handling equipment;
- Importation of sulphur in prilled form;
- Use of dust control sprayers at transfer points;
- Use of non-spark and corrosion resistant materials for the shed roof and walls;
- Possible use of a magnetic extractor to remove spark-causing metal fragments from the sulphur;
- Installing the requisite evacuation points to ensure the facility can be efficiently evacuated in the event of a fire;
- Developing and applying emergency procedures to be followed in the event of a fire;
- In addition to the automated fire extinguishing system, position manually operated fire fighting resources throughout the facility and train all personal in their use;
- Keeping breathing apparatus readily available for fire fighting purposes at the facility; and
- Providing intensive safety induction training to employees to ensure that they are well aware of the dangers associated with sulphur fires and explosions and are aware of the procedures to follow in the event of a fire or explosion.

With these mitigation measures in place, the extent of the potential impact would be local and its duration short term. The magnitude would, however, be medium, since a notable alteration in social functions and processes may result. This impact is thus regarded as of low negative significance.

Conclusion

The following table pressents a summary of the impact assessment for this potential impact, but only with the recommended mitigation measures in place, since the facility would not be allowed to operate without them.

Risk to employees in the event of a sulphur fire or explosion

	No mitigation	Mitigation
Extent	-----	Local
Magnitude	-----	Medium
Duration	-----	Short Term
SIGNIFICANCE	-----	Low (-)
Probability	-----	Unlikely
Confidence	-----	Certain
Reversibility	-----	Irreversible

Risk to the public in the event of a sulphur fire or explosion

Description

A sulphur fire or explosion could result in a potential health hazard to nearby residents and neighbouring land users in the port.

Quantification

For a quantification of this impact, please see "Risk to employees in the event of a sulphur fire or explosion" above. It should be noted that in the event of a large fire at the facility, toxic fumes and smoke could be blown into the surrounding inhabited areas of Walvis Bay. Also, due to the extreme temperatures that may result from combusting sulphur, neighbouring facilities should also be notified of the possibility of being evacuated in the event of fire.

Through the implementation of the necessary controls, the probability of a fire or explosion occurring in the facility is considered to be unlikely. Note that the "no mitigation" situation is not addressed in the table below, since installing the mitigation measures as described would be a statutory requirement and would be undertaken by Rössing Uranium in any event.

Mitigation

The mitigation measures described in "Risk to employees in the event of a sulphur fire or explosion" above, which relate predominantly to the prevention and management of fire episodes, are also applicable here. In addition to these measures the following are also recommended:

- Rössing Uranium must liaise with the port and municipal emergency authorities, formulating an emergency plan in the event of a fire or explosion occurring at the facility. This plan should include an evacuation plan for residential areas that may be upwind of the fire and may be inundated with toxic fumes;
- Rössing Uranium must ensure that an effective access control system is in place that prevents members of the public or other unauthorised persons entering the facility; and
- Care must be taken to ensure that potential fire hazards and other flammable materials or installations are set back from the sulphur handling facility, so as to prevent a chain reaction industrial fire or explosion from occurring.

With these mitigation measures in place, the extent of the potential impact would be local and its duration short term. The magnitude would, however, be medium, since a notable alteration in social functions and processes may result. This impact is thus regarded as of low negative significance.

Conclusion

The following table summarises of the impact assessment for this potential impact, but only with the recommended mitigation measures in place, since the facility would not be allowed to operate without them.

Risk to the public in the event of a sulphur fire or explosion

	No mitigation	Mitigation
Extent	-----	Local
Magnitude	-----	Medium
Duration	-----	Short Term
SIGNIFICANCE	-----	Low (-)
Probability	-----	Unlikely
Confidence	-----	Certain
Reversibility	-----	Reversible

Impact of sulphur spillage in the public domain

The scope of the SEIA for sulphur handling in the Port of Walvis Bay ends where the sulphur is loaded into the rail cars at the sulphur storage facility. Previously, reports of sulphur spillages along the railway line between Walvis Bay and Rössing Uranium mine have raised concerns and accidents at rail crossings have also occurred in the past. Since this issue was again raised by I&APs and stakeholders, it is briefly addressed here.

The completed Phase 1 SEIA for the Rössing Uranium expansion project dealt with the matter of spillages along the railway line, emergency remediation, and procedures for dealing with railway accidents. In particular, the SEMP for the Phase 1 SEIA addressed the means by which adequate control could be exerted over sulphur spillage. The following is an extract from the Phase 1 SEMP:

> *The train should be fitted with the necessary communications systems allowing the operator to notify TransNamib, Rössing Uranium, NamPort and the relevant governmental emergency services in the event of a rail accident or product spillage. Procedures to isolate the incident area and rapidly contain and/or neutralise any spillages should be in place and sanctioned by the relevant authorities. All railway wagons, engines, railroad crossings and the railway tracks should receive regular inspections and maintenance where required. Such inspections and any resultant repair work should be appropriately documented. All statutory requirements and best practice should be observed.*

With the establishment of an acid burning plant at the mine and the proposed sulphur handling facility in the port, elemental sulphur feedstock will now be transported rather than the more hazardous sulphuric acid. Rössing Uranium is also aiming toward a zero spillage system for all operations, including the use of purpose-designed, zero-spill rail cars for the transportation of sulphur.

As a result of the above, the overall risk and likelihood of spillages and accidents occurring in the public domain is considerably reduced. Since the issue has been addressed in detail in the Phase 1 SEIA and associated SEMP, it is not regarded necessary to consider it further here.

Impact of increased noise and vibration

Description

The activity of sulphur handling and the equipment used to undertake this operation could potentially increase the noise impacts to the nearby public receptors and residential areas.

Quantification

The various mobile plant, conveyor belt systems and rail wagon loading systems will generate noise during operation. However, due to the location of the proposed facility within the industrialised zone of the port the increase in noise will be marginal. The following extract is from the specialist noise and vibration report:

> *The various operations are predicted to be well within the daytime noise criterion, and only marginally above the night-time criterion. They are also predicted to be not significantly different from the current noise climate, which is mixed industrial noise, including railway activities, on-site truck movements, materials handling, loading and unloading, industrial and commercial machinery, and local traffic noise on the public access roads.*
>
> *In the worst case, as described above, with no mitigating measures, the daytime impact will be none at the port boundaries and the night-time impact none to very low, assuming provision for 24-hour operation of the facility will be necessary.*

The full environmental noise report is attached to this report as Annexure D2. Two monitoring stations were set up at the boundaries of the port area for the purposes of this assessment and the average ambient noise was determined to be 50.525 $L_{Aeq,I}$ and 55.914 $L_{Aeq,I}$. The probable noise levels generated by the various items of plant and equipment were then extrapolated to the nearest residential area and the findings are as follows:

- Siwertell ship unloader = 47 dB(A) (Note that at the time of the assessment the preferred alternative included the use of a much larger dock mounted Siwertell unit than that comprising the current preferred alternative which entails a smaller mobile Siwertell option, thus the actual noise level is expected to be significantly less);
- The tractor trailer shuttle operations between the dock and storage shed = 34 dB(A);
- The stockpiling operation inside the shed = 41 dB(A);
- The railcar loading system = negligible (50 dB(A) when immediately outside the structure); and
- The rail operations = less than or equal to the current operations.

When these calculated values are compared with the existing ambient noise levels at the nearest residential areas it can be seen that will not exceed the SANS 10103:2008 recommended daytime values for suburban districts, which is 50 dB(A). The proposed activity is assessed as having no impact on the continuous daytime noise levels.

The recommended night-time SANS 10103:2008 threshold value is set at 40 dB(A) for suburban areas. Continuous ship unloading is planned to happen for 4 days per load, at 50-day intervals. As such, it has the potential to impact on the ambient noise levels as experienced by the closest residents. The potential noise impacts arising from night-time operations without mitigation measures in place, when measured at the port boundaries, is assessed as having no to very little impact on the ambient noise levels.

Mitigation

Proposed mitigation strategies to limit the environmental noise impacts associated with the sulphur storage shed and associated activities are as follows[24]:

- Proper design and maintenance of silencers on diesel-powered equipment and systematic maintenance of all types of equipment;
- Training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events;
- Where possible material stockpiles should be placed so as to protect against noise from individual operations and especially from haul roads (which for greatest effect should be placed directly behind such roads, and be of such a height as to effectively act as a noise barrier), if line of sight calculations show this to be practicable;
- The erection of suitable earth berms around fixed plant such as compressors can significantly reduce the noise by up to 15 dB;

[24] Source: JH Consulting. Environmental Noise Report. 2009 (Annexure C2).

- Standardised noise measurements should be carried out on individual equipment at the delivery to site to construct a reference data-base and regular checks carried out to ensure that equipment is not deteriorating and to detect increases which could lead to increase in the noise impact over time and increased nuisance to the public; and
- Environmental noise monitoring should be carried out regularly to detect deviations from predicted noise levels and enable corrective measures to be taken where warranted.

Conclusion

The following table is a summary of the impact assessment for this potential impact, both with and without the recommended mitigation measures in place.

Impact of increased environmental noise

	No mitigation	Mitigation
Extent	Local	Local
Magnitude	Very Low	Very Low
Duration	Long term	Long term
SIGNIFICANCE	Very low (-)	Very low (-)
Probability	Definite	Probable
Confidence	Sure	Sure
Reversibility	Reversible	Reversible

Visual impact of the sulphur handling facility

Description

The proposed sulphur handling facility in the Port of Walvis Bay may pose visual impacts from the perspective of public receptors and the sense of place of the area.

Quantification

The following quantification of impact is derived from the specialist report by VRM Africa which is included in this Draft SEIA Report as Annexure D3.

A preliminary study into the landscape character of the area was undertaken. It was determined that, although the key receptors would have high levels of visual exposure to the proposed landscape modification, the significance of the visual impact would be low due to high levels of existing contrast created by the harbour infrastructure surrounding the site. These high levels of contrast increase the visual absorption capacity of the surroundings. Should the proposed structure be of a similar scale, form and line to the existing, adjacent warehouse type structures, the level of visual impact would be reduced.

The magnitude of the impact is considered to be low, since social functions and processes would be slightly altered. The duration of the impact will be for the entire life of the facility and it is thus considered as long term, while its extent would be local. This impact is thus considered to be of low negative significance.

Mitigation

The mitigation measures to limit the impact associated with the visual intrusion of the proposed sulphur handling facility, as recommended by VRM Africa, are as follows:

- Light coloured paints and reflective building materials should not be used. Darker grey colours and rougher textured materials would created less contrast to the surrounding areas and reduce the level of visual impact. The proposed structure should be of a similar size and scale to the existing warehouse structures adjacent to the site;
- To reduce the impact of the heavily industrial nature of the proposed structure, as seen from the close receptors, the existing avenue of palm trees should be continued around the edge of the harbour boundary; and

- The structure should be positioned as close as possible to the existing structures, so that they are seen as a single unit. This would reduce the protrusion effect of the structure as seen from close residential receptors.

With these mitigation measures in place, the extent of the potential impact would remain local and its duration long term. The magnitude could, however, reduce to very low, since a negligible alteration in social functions and processes may result. This impact is thus regarded as of very low negative significance if the recommended mitigation measures are put in place.

Conclusion

The following table is a summary of the impact assessment for this potential impact, both with and without the recommended mitigation measures in place.

Visual impact on of the sulphur handling facility

	No mitigation	Mitigation
Extent	Local	Local
Magnitude	Low	Very Low
Duration	Long term	Long term
SIGNIFICANCE	Low (-)	Very low (-)
Probability	Definite	Probable
Confidence	Sure	Sure
Reversibility	Reversible	Reversible

Contamination of other commodities or materials with sulphur dust

Description

The contamination of other commodities, materials and operations in the port by sulphur and fugitive sulphur dust may pose potential impacts.

Quantification

Other materials, commodities and operations in the port becoming contaminated by sulphur and sulphur dust would only occur as a result of a sulphur spillage that is not dealt with immediately. Such a spillage would then be exposed to the wind, rain or the movement of other port equipment which could lead to the mobilisation of small quantities of sulphur into the surrounding operations and material or commodity stockpiles.

The design and management of the facility and its operations are aimed at achieving a closed or zero spillage system. The sulphur storage facility itself will be enclosed so as to exclude the loss of dust as a result of wind or rain. Hard flooring and bund systems will ensure that sulphur in runoff water is prevented from leaving the facility in an uncontrolled fashion. Sulphur will be imported in the form of prills, a low-dust elemental form of the product, which means that even when the stockpiles are exposed to the wind, fugitive dust should be limited.

Against this background, the likelihood of sulphur becoming mobile under normal operating conditions and in the volumes required to pose a contamination risk to surrounding commodity or material stockpiles and operations is remote, and the significance of this impact is therefore considered to be low. Note that the "no mitigation" situation is not addressed in the table below, since installing the mitigation measures as described would be a regulatory requirement that would be undertaken by Rössing Uranium as standard operating procedures.

Mitigation

Given the design elements already proposed for the facility in pursuit of a zero-spill system, the proposed facility has all the measures necessary to prevent the mobilisation of sulphur into the surrounding physical environment. The potential for contamination of surrounding operations will therefore be determined by the correct and effective management of the facility. A specific area where there may be a heightened possibility of spillage is during the unloading of the ship and transport from the quayside to the storage shed. The following additional mitigation measures are recommended to protect against possible contamination events from occurring;

The mobile equipment used to directly handle the sulphur inside the facility should be used exclusively for that purpose and such equipment should not vacate the facility to undertake other work without being washed down first;

- A purpose-designed wash bay should be established to ensure that equipment leaving the facility can be cleaned before such departure;
- All personnel at all areas should be trained in spill response protocols. In the event of a spill, cleanup teams should be dispatched immediately. Appropriate equipment to rapidly affect such cleanup should be available and able to be readily mobilised;
- Trucks and other vehicles leaving the storage facility must have their wheels checked and cleaned of any sulphur residue;
- Tractor-trailer shuttle wagons will be covered to contain sulphur dust,
- Dust suppression systems will be used on transfer points;
- Equipment used for the handling of sulphur, particularly the ship off-loader, should be used exclusively for that purpose, in the rare event that equipment is to be used for the handling of other materials or commodities, such equipment must be thoroughly cleaned;
- All transfer points and conveyor systems shall be covered as far as possible and will employ low agitation methods including minimised fall heights and dust suppression sprayers to reduce the generation and mobilisation of sulphur dust. This includes the main shed and the train loading area.
- The storage shed vehicular access points must be kept free of sulphur residue that could be entrained with vehicle movements; and
- The implementation of the mitigation measures proposed for sulphur dust control will also limit the mobilisation of sulphur into the surrounding areas.

With these mitigation measures in place, the extent of the potential impact would be local and its duration short term. The magnitude would be low, since a slight alteration in social functions and processes may result. This impact is thus regarded as of low negative significance.

Conclusion

The following table provides a summary of the impact assessment for this potential impact, but only with the recommended mitigation measures in place, since the facility would not be operated without them.

Impact of sulphur contamination of other commodities and materials in the port

	No mitigation	Mitigation
Extent	-----	Local
Magnitude	-----	Low
Duration	-----	Short term
SIGNIFICANCE	-----	Low (-)
Probability	-----	Probable
Confidence	-----	Certain
Reversibility	-----	Reversible

Operational phase impacts on the biophysical environment

Sulphur contamination of the Walvis Bay Ramsar site

Description

The proposed sulphur handling facility in the Port of Walvis Bay may potentially pose contamination impacts as a result of release of sulphur dust into the environment, particularly insofar as these possible effects may be felt in the adjacent Walvis Bay Ramsar[25] site.

Quantification

Sulphur dust may be generated during the handling of sulphur at any one of the handling or transfer areas where the material is physically agitated or where the stockpile or spillage is exposed to the wind. Depending on the wind direction and velocity, this dust could then be carried into the Walvis Bay lagoon where it could settle and interact with the natural environment. Elemental sulphur is known to be of low toxicity and naturally abundant and thus, in small quantities, the escape of sulphur dust into the Ramsar site is not likely to present a significant hazard in either the terrestrial or aquatic habitats. This is supported by the following excerpt from the Infotox report (Annexure D1):

> *Sulphur is an essential element for the entire biological kingdom. Sulphur is used to control fungi and mites on fruits and vegetables, but is practically non-toxic to birds and aquatic animal species. In studies on ecological effects involving two fish species, daphnia, and mysid shrimp, sulphur as been shown to be practically non-toxic to the aquatic species tested. Sulphur is also considered non-toxic to birds. Very little else is known of the effect of sulphur on animals. It is unlikely that concentrations within the recommended human health risk-based air limits will be a threat to plants, animals or aquatic organisms in the vicinity.*

In the management of this potential impact, a cautionary approach has been adopted. As described elsewhere in this report, the proposed sulphur handling facility will be designed using best practice principles that aim for a zero spillage design and operation of the facility. The sulphur stockpile itself will be housed in a completely enclosed storage shed and thus wind generated dust from the stockpile is unlikely. Due to the risk associated with a sulphur dust explosion in a confined area, sulphur dust levels inside the facility will be kept at a level far below that which would constitute a contamination risk to the surrounding environment. The greatest potential for the generation of fugitive sulphur dust is associated with the out-of-shed activities, namely the handling, transfer, short haul and potential spillage of the sulphur. Measures to limit the generation and mobility of sulphur dust that are included in the design and operation of the facility encompass dust control systems at transfer points, the specification of sulphur in prilled form and the use of wash bays for equipment.

Against this background, the likelihood of sulphur becoming mobile under normal operating conditions and in the volumes required to pose a contamination risk to the Walvis Bay Ramsar site is remote. Note that the "no mitigation" situation is not addressed in the table below, since installing the mitigation measures as described would be a regulatory requirement that would be undertaken by Rössing Uranium as standard operating procedures.

Mitigation

The implementation of the mitigation measures proposed for sulphur dust control will also limit the mobilisation of sulphur into the surrounding areas. These measures would serve to mitigate possible contamination of the Ramsar site and are recommended here again:

- The mobile equipment used to directly handle the sulphur inside the facility should be used exclusively for that purpose and such equipment should not vacate the facility to undertake other work without being washed down first;

[25] An international convention that affords conservation status to specific wetlands.

- A purpose-designed wash bay should be established to ensure that equipment leaving the facility can be cleaned before such departure;
- All personnel at all areas should be trained in spill response protocols. In the event of a spill, cleanup teams should be dispatched immediately. Appropriate equipment to rapidly effect such cleanup should be available and able to be readily mobilised;
- Trucks and other vehicles leaving the storage facility must have their wheels checked and cleaned of any sulphur residue; and
- The storage shed vehicular access points must be kept free of sulphur residue that could be entrained with vehicle movements.

With these mitigation measures in place, the extent of the potential impact would be local and its duration short term. The magnitude would be very low, since negligible alteration in natural functions and processes may result. This impact is thus regarded as of very low negative significance.

Conclusion

The following table is a summary of the impact assessment for this potential impact, but only with the recommended mitigation measures in place, since the facility would not be operated without such.

Impact of potential sulphur contamination on the Walvis Bay Ramsar site

	No mitigation	Mitigation
Extent	-----	Local
Magnitude	-----	Very low
Duration	-----	Short term
SIGNIFICANCE	-----	Very low (-)
Probability	-----	Unlikely
Confidence	-----	Sure
Reversibility	-----	Reversible

Risk associated with the release of sulphur contaminated run-off

Description

There is a potential that the release of sulphur contaminated water, in the form of storm-water or wash down water, may pose groundwater and other biophysical impacts.

Quantification

Elemental sulphur is considered to be of low toxicity and thus does not pose a significant hazard to the biophysical environment in this form. However, in the presence of water, sulphur could form an acid which may pose a threat to both the physical and natural environment, through modifications to the pH of the receiving environment.

Rössing Uranium is committed to observing all best practices for the sulphur handling facility and thus the facility would be designed in a manner that largely prevents contamination of storm water and through capturing and treating such water before it is released. The operation of the facility will be conducted within specified design limits and according to the necessary procedures to prevent accidental spillages or the release of dust or other vectors of water contamination. A water treatment plant should be established as part of the facility, to receive water containing sulphur or other contaminants before their release. The facility should have the necessary bunds and water channels that would capture and direct all potentially contaminated storm water and wash water from the equipment wash bays to the treatment facility.

Against this background, the likelihood of sulphur contamination of runoff water that leaves the site is remote. Note that the "no mitigation" situation is not addressed in the table below, since installing the mitigation measures as described would be a regulatory requirement that would be undertaken by Rössing Uranium as standard operating procedures

Mitigation
The following mitigations with regard to this potential impact are recommended:

- All previously mentioned mitigation measures relating to the prevention and cleanup of accidental spillages and the control of sulphur dust are relevant;
- Rössing Uranium should limit, as far as possible, the contamination of water, through the use of air compressors and vacuum cleaners to undertake the cleaning of plant and equipment, without causing a dust generation problem; and
- Installation of a water treatment system prior to discharge, with separated sulphur to be transported to the mine for disposal and cleaned water stored for fire extinguishing purposes.

With these mitigation measures in place, the extent of the potential impact would be local and its duration short term. The magnitude would be very low, since negligible alteration in natural functions and processes may result. This impact is thus regarded as of very low negative significance.

Conclusion
The following table is a summary of the impact assessment for this potential impact, but only with the recommended mitigation measures in place, since the facility would not be operated without them.

Release of sulphur contaminated runoff

	No mitigation	Mitigation
Extent	-----	Local
Magnitude	-----	Very low
Duration	-----	Short term
SIGNIFICANCE	-----	Very low (-)
Probability	-----	Unlikely
Confidence	-----	Sure
Reversibility	-----	Reversible

Construction phase impacts

Generic construction phase impacts

Description
There are impacts on the socio-economic and biophysical environment that would occur during the construction phases of the proposed sulphur handling facility that are not exclusive to the particular project. Such generic impacts are common to all construction sites and can usually be reliably predicted and mitigated.

Quantification
The generic construction-related impact management actions listed above have been incorporated within the Social and Environmental Management Plan (SEMP) compiled as part of this Draft SEIA Report and presented as Annexure B hereto. Together with the continued application of Rössing Uranium's own best practice and performance standards, particularly those relating to occupational health and safety, typical construction-related impacts can be confidently predicted to be well managed. By implication, any contractors tasked with construction activities will be obliged to maintain the same high standards.

Mitigation
Typical construction phase impact management actions would include the following:

- Dust, noise and vibration control;
- Secure storage of fuel and hazardous materials;
- Proper maintenance and operation of equipment and machinery;
- Proper collection, storage and disposal of refuse;
- Provision of facilities for workers on site (lighting, toilets, water, eating areas etc.);
- Installation of emergency plans (fire, evacuation etc.) and first-aid procedures;
- Control of traffic safety and road conditions;
- Application of access control and security procedures;
- Application of statutory occupational health and safety standards throughout the site;
- Installation of contingency plans for spillage of fuels or hazardous substances;
- Demarcation of exclusion zones to limit biodiversity disturbance, heritage resource impacts and soil erosion; and
- Control of surface runoff and impacts on water resources.

Best practice and appropriate environmental control measures will be applied and Rössing Uranium is committed to compliance with all the statutory requirements that govern typical construction site impacts. With these construction mitigation measures in place, the extent of the potential impact would be local and its duration short term. The magnitude would be very low, since negligible alteration in natural functions and processes may result. This impact is thus regarded as of very low negative significance.

Conclusion
The following table is a summary of the impact assessment for potential construction impacts, but only with the recommended mitigation (construction control) measures in place, since the facility would not be operated without such measures.

Generic construction phase impacts

	No mitigation	Mitigation
Extent	-----	Local
Magnitude	-----	Low
Duration	-----	Short term
SIGNIFICANCE	-----	Very low (-)
Probability	-----	Definite
Confidence	-----	Certain
Reversibility	-----	Reversible

Impact on employment creation during construction

Description
Under assessment is the number of employment opportunities that will be created during the construction phase of the sulphur handling facility.

Quantification
Construction projects are generally labour-intensive, although this fact must be offset against the non-permanent nature of the employment. Initial estimates are that the sulphur handling facility would provide in the order of 15 to 20 construction jobs. It should be noted that the proportion of unskilled workers required during construction is higher than during the operational phase. A positive benefit of in-service skills enhancement is thus available. Although of limited duration, construction phase employment will also contribute to the multiplier effect in the local economy.

Due the relatively small scale of the sulphur handling facility and associated construction, the impact would only be felt at a local level since employment would largely be limited to the immediate Walvis Bay labour pool. The duration of the impact is regarded as short term and its magnitude is regarded as low since there would be a slight alteration in livelihood enhancement of the greater community. The significance of employment opportunities during the construction phase is therefore regarded as a very low positive.

Mitigation

There is the potential to further enhance the positive impact of construction phase employment, if contractors were to be required to undertake in-service job training. The potential of temporary workers finding permanent employment or being better equipped to find employment outside of this construction phase would thus be enhanced. However, the low skills base and short term nature of construction employment would not significantly increase the already positive impact.

Conclusion

The following table presents a summary of the impact assessment for this potential impact, both with and without the recommended mitigation measures in place.

Impact on employment creation during construction

	No mitigation	Mitigation
Extent	Local	Local
Magnitude	Low	Low
Duration	Short term	Short term
SIGNIFICANCE	Very Low (+)	Very Low (+)
Probability	Definite	Probable
Confidence	Certain	Sure
Reversibility	Reversible	Reversible

Cumulative impacts

As described in "Consideration of cumulative impacts", cumulative impacts are difficult to deal with, since they may occur outside of the geographical area of the particular project being assessed and thus require the collaboration of other institutions, and involve broader social, economic and biophysical considerations outside the scope of project-level assessment. The fact that several other mining companies are currently pursuing uranium interests in the Erongo Region emphasizes the need for a holistic approach, by means of a strategic or sectoral level assessment. Such a forward-planning approach would require the collaboration of all the mining companies, under the guidance of relevant government departments, to bring about a common understanding of the entire array of cumulative, secondary and tertiary environmental impacts resulting from mining and mining related activities in the region, including the implications of materials handling in the Port of Walvis Bay.

As far as the SEIA process for Rössing Uranium's sulphur handling component of the expansion project is concerned, the following impacts emerged as having cumulative social and environmental implications and these have been considered as far as is practicably possible in the present SEIA process and recommendations have been formulated where appropriate.

Employment creation

Although current and planned mining activity in the Erongo Region may offer significant employment opportunities, the sulphur handling facility in the Port of Walvis Bay is limited in this respect. Nevertheless, the secondary and tertiary consequences that result from the multiplier effect can be enhanced by means of on-going training and skills development. Support should thus be given to such training initiatives in the mining sector, with resultant benefits in terms of achieving economy of scale. Recognising its limited effect in this case, Rössing Uranium's efforts in technical skills development in the fields of mining and engineering should nevertheless be applied to the proposed sulphur handling facility.

Public health

Cumulative impacts from potential exposure to sulphur, sulphur dust and impacts associated with sulphur fires and explosions may have consequences for public health. However, the assessment of these impacts have shown that, as when compared to the current situation, namely the importation of sulphuric acid, the hazards are not only reduced but of an acceptably low significance, particularly given the mitigation measures recommended or already in place, and their on-going management and monitoring.

Local economies

The cumulative socio-economic situation should generally improve as a result of the current and future activities of all of the mining companies in the Erongo Region, since the additional requirement for goods and services will stimulate the secondary and tertiary commercial sectors. To further enhance this positive impact in the construction and operation of the proposed sulphur handling facility, Rössing Uranium should continue its policy of local procurement, particularly by supporting the building of capacity amongst local Walvis Bay service providers, seeking opportunities for the participation of women in the local economy, and prioritising diversification and development that will reduce dependence on mining-related activities.

Inward migration

The stimulation of the economy and possibility of employment opportunities that will result from the current and future activities of all the mining companies in the Erongo Region will potentially attract people from economically less well endowed parts of Namibia. This has the unfortunate consequence of increasing local unemployment rates, densification of already inadequate housing and informal settlements, and related increases in poverty, ill-health and social ills. However, in the case of Rössing Uranium's proposed sulphur handling facility in the Port of Walvis Bay, it will in itself not be the trigger for significant inward migration, given the low levels of expected employment creation.

Regional infrastructure

Increased demands on the supply and reticulation of water and the provision of electricity and transportation facilities are consequences of the cumulative need for such services for all the mining companies and other parties in the region. The additional supply of water in bulk to Rössing Uranium and other users is due to be provided by means of a desalination plant commissioned by NamWater. As far as electricity is concerned, the present high demand being experienced regionally will be somewhat ameliorated by Rössing Uranium reducing their needs as a consequence of utilising additional electricity generated by their proposed sulphur-burning acid plant. Independent of the expansion project as a whole, the proposed sulphur handling facility in the Port of Walvis Bay will not place significant additional pressure on the existing infrastructure or service provision.

CONCLUSIONS AND RECOMMENDATIONS

This chapter concludes the report, describes the recommendations that have emerged from the assessment of identified potential impacts and mitigation measures, and provides a synopsis of the preferred alternative actions that Rössing Uranium is applying for authorisation of.

Conclusions

The proposed development consists of Rössing Uranium's sulphur handling facility in the Port of Walvis Bay that allows for the following activities to be undertaken:

- Unloading prilled sulphur from ship;
- Transportation of sulphur from ship to storage shed;
- Storage of sulphur in a mass stockpile and the management thereof;
- Reclaiming sulphur from the stockpile and transportation to the railcar loading area; and
- Loading of purpose-designed railcars with sulphur for transportation to Rössing Uranium mine.

We submit that this Draft SEIA Report provides an adequate assessment of the environmental issues raised during the Scoping Stage by I&APs, stakeholders, national, regional and local authorities, Rössing Uranium's technical team and the SEIA project team. Table 10 provides a summary of the significance of the environmental impacts associated with this proposed project.

Table 10: Summary table of impact significance

Aspect	iMPACT	NO MITIGATION	MITIGATION
Operational Phase			
Socio-economic environment	Impact on permanent employment creation	Very low (+)	Low (+)
	Impact on worker health and safety in a sulphurous work environment	Low (-)	Low (-)
	Impact on economic environment associated with a sulphur fire or explosion	-----	Low (-)
	Risk to employees in the event of a sulphur fire or explosion	-----	Low (-)
	Risk to the public in the event of a sulphur fire or explosion	-----	Low (-)
	Impact of increased environmental noise on environment	Very low (-)	Very low (-)
	Visual Impact of the sulphur handling facility	Low (-)	Very low (-)
	Impact of sulphur contamination of other commodities and materials in the port	-----	Low (-)
Biophysical environment	Impact of potential sulphur contamination on the Walvis Bay RAMSAR site	-----	Very low (-)
	Release of sulphur contaminated runoff	-----	Very low (-)
Construction phase impacts			
Construction Phase Impacts	Generic construction phase impacts	-----	Very low (-)
	Impact on employment creation during construction	Very Low (+)	Very Low (+)
Impact Significance Legend			
High (+)	Medium (+)	Low (+)	Very low (+)
Very low (-)	Low (-)	Medium (-)	High (-)

Level of confidence in assessment

With reference to the information available at this stage of the project planning cycle, the confidence in the environmental assessment undertaken is regarded as acceptable for decision making.

It is acknowledged that the project details may evolve during the detailed design and construction phases. However, these are unlikely to change the overall environmental acceptability of the proposed project. Furthermore, any significant deviation from that assessed in this SEIA should be subject to further assessment and may require an amendment to the conditions of the MET:DEA clearance, after due process has been met.

Operational phase impacts on the social and biophysical environment

Table 10 summarises the assessments of impacts of the operation of the proposed sulphur handling facility and its associated activities on the social and biophysical environment. The most significant negative impacts, i.e. those of a ***low negative rating after mitigation measures are applied***, are associated with possible impacts arising from a potential sulphur fire or dust explosion occurring at the facility and the resulting possible harm to persons and property, and potential contamination of other commodities and materials in the port. The project has the potential to create a low positive impact on employment creation with mitigations in affect.

Construction phase impacts

Table 10 includes a summary of the assessment of impacts of the construction of the proposed sulphur handling facility and its associated activities on the social and biophysical environment. The construction phase of the sulphur handling facility is not expected to result in any significant social or environmental impacts. Generic construction phase impacts can be effectively managed through the implementation of a Social and Environmental Management plan, as attached as Annexure B. Employment creation during the construction phase is rated as having a very low positive impact.

Social and Environmental Management Plan

A draft of the SEMP that has been developed to guide the construction and operational phases of the proposed project is contained in Annexure B of this report. The implementation of the SEMP would minimise possible negative impacts on construction and operation and assign responsibility for environmental controls, i.e. ensure that the recommended mitigation measures are applied and the impact significance ratings are consequently reduced to acceptable levels. More detailed project specifications, for inclusion in the various construction contracts, would be required should the project be approved and the engineering designs of the various components have been finalised. The detailed project specification would also take cognisance of any conditions of the MET:DEA clearance.

It should be noted that the Draft SEMP presented in Annexure B is designed to serve as a clear and detailed indication of Rössing Uranium's intention to address environmental controls during the construction and operational phases of the sulphur handling facility. Its finalisation and ultimate approval is expected to be a condition of the environmental clearance presently being sought from MET:DEA.

Recommendations

Alternatives

With reference to the alternatives examined in this SEIA process for Rössing Uranium's proposed sulphur handling facility in the Port of Walvis Bay it can be confirmed that suitable levels of mitigation of the identified impacts are possible and that the preferred alternatives are acceptable from a social and environmental perspective.

The suite of preferred alternatives that would make up the proposed facility comprise the following:

- Sulphur unloading from ship by means of a truck-mounted Siwertell continuous ship unloader;
- Transport from the quayside to the storage shed by means of side-tipping truck/tractor drawn trailers;
- Storage shed location at Option D (see Figure 13);
- Storage shed comprising a steel frame with Fibre-cement sheets for cladding, used to accommodate 20 000 t of elemental sulphur in prilled form, on an cement floor;
- Stockpiling in the storage shed by means of an extendable conveyor;
- Reclaiming for transport to the mine by means of rubber-tired front end loader via hoppers into fixed conveyor; and
- Loading hopper wagons railcars by means of loading bins fed by the fixed conveyor.

Mitigation measures

For the majority of the identified impacts examined, the most effective mitigation measures were in the application of international best practice, either in the engineering design of the particular sulphur handling facility and associated operations, or through the strict on-site implementation of statutory and Rössing Uranium's operational controls. In this way, prescribed performance standards or limits are more likely to be met and there is no need for the specification of additional mitigation measures, since the objective of mitigation has effectively been addressed.

This section summarises the recommended mitigation measures described in the previous chapter, where these are available, and the assumption is made that these will be implemented, given that it is transferred to the SEMP.

- **Employment creation (construction and operation):**
  - On-going training and skills enhancement programmes applied throughout Rössing Uranium are extended to the sulphur handling facility staff compliment; and
  - Construction contractors are required to undertake in-service job training.
- **Worker health and safety in a sulphurous environment:**
  - As a precautionary measure, concerted efforts should be made to limit sulphur concentrations in the air to below 0.125 mg/m^3 at all times;
  - Dust control systems such as sprayers should be fitted to transfer points and handling areas, so as to avoid the generation and mobilisation of breathable sulphur dust; and
  - Workers should be provided with the necessary Personal Protective Equipment (PPE) when coming into direct contact with sulphur.
- **Economic implications of a sulphur fire or explosion:**
  - The facility is to be fitted with the requisite evacuation points to ensure it can be completely and quickly vacated in the event of a fire;
  - Emergency procedures to be followed in the event of a fire should be put in place;
  - In addition to the automated fire extinguishing system, manually operated fire fighting resources should be positioned throughout the facility and all personal are to be trained in their use;
  - Breathing apparatus for fire fighting purposes shall be kept a the facility so that, in the event of a fire, employees can respond to and extinguish such fires without inhaling toxic fumes;
  - Employees should undergo intensive safety induction training to ensure that they are well aware of the dangers associated with sulphur fires and explosions and are aware of the procedures to follow in such an event;
  - Additional mitigation measures such as the provision of smoking areas should be included in the SEMP;
  - Rössing Uranium must liaise with the port and municipal emergency authorities in formulating a emergency plan in the event of a fire or explosion occurring at the facility. This plan should include an evacuation plan for residential areas that may be upwind of the fire and may be inundated with toxic fumes;
  - Rössing Uranium must ensure that the an effective access control system is in place that prevents members of the public or other unauthorised persons entry to the facility; and
  - Care must be taken to ensure that potential fire hazards and other flammable materials or installations are set back from the sulphur handling facility, so as to prevent a chain reaction industrial fire or explosion from occurring.
- **Risk to employees and the public in event of a sulphur fire or explosion:**
  - Installation of infrared fire detection sensors and automated fire extinguishing sprinklers and alarms;
  - Use of asphalt flooring to reduce the occurrence of sparking by handling equipment;
  - Importation of sulphur in prilled form;
  - Use of dust control sprayers at transfer points;
  - Use of non-spark and corrosion resistant fabric for the shed roof;
  - Possible use of a magnetic extractor to remove spark-causing metal fragments from the sulphur;

  - Installing the requisite evacuation points to ensure the facility can be completely and quickly vacated in the event of a fire;
  - Developing and applying emergency procedures to be followed in the event of a fire;
  - In addition to the automated fire extinguishing system, position manually operated fire fighting resources throughout the facility and train all personal in their use;
  - Keeping breathing apparatus readily available for fire fighting purposes at the facility;
  - Providing intensive safety induction training to employees to ensure that they are well aware of the dangers associated with sulphur fires and explosions and are aware of the procedures to follow in the event of a fire or explosion;
  - Rössing Uranium must liaise with the port and municipal emergency authorities, formulating an emergency plan in the event of a fire or explosion occurring at the facility. This plan should include an evacuation plan for residential areas that may be upwind of the fire and may be inundated with toxic fumes;
  - Rössing Uranium must ensure that an effective access control system is in place that prevents members of the public or other unauthorised persons entering the facility; and
  - Care must be taken to ensure that potential fire hazards and other flammable materials or installations are set back from the sulphur handling facility, so as to prevent a chain reaction industrial fire or explosion from occurring.
- **Increased noise and vibration:**
  - Proper design and maintenance of silencers on diesel-powered equipment and systematic maintenance of all types of equipment;
  - Training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events;
  - Where possible material stockpiles should be placed so as to protect against noise from individual operations and especially from haul roads (which for greatest effect should be placed directly behind such roads, and be of such a height as to effectively act as a noise barrier), if line of sight calculations show this to be practicable;
  - The erection of suitable earth berms around fixed plant such as compressors can significantly reduce the noise by up to 15 dB;
  - Standardised noise measurements should be carried out on individual equipment at the delivery to site to construct a reference data-base and regular checks carried out to ensure that equipment is not deteriorating and to detect increases which could lead to increase in the noise impact over time and increased nuisance to the public; and
  - Environmental noise monitoring should be carried out regularly to detect deviations from predicted noise levels and enable corrective measures to be taken where warranted.
- **Visual impact of sulphur handling facility:**
  - Light coloured paints and reflective building materials should not be used. Darker grey colours and rougher textured materials would created less contrast to the surrounding areas and reduce the level of visual impact. The proposed structure should be of a similar size and scale to the existing warehouse structures adjacent to the site.
  - To reduce the impact of the heavily industrial nature of the proposed structure, as seen from the close receptors, the existing avenue of palm trees should be continued around the edge of the harbour boundary.
  - The structure should be positioned as close as possible to the existing structures to the west, so that they are seen as a single unit. This would reduce the protrusion effect of the structure as seen from close residential receptors.
- **Contamination of other commodities or materials, and the Ramsar site:**
  - The mobile equipment used to directly handle the sulphur inside the facility should be used exclusively for that purpose and such equipment should not vacate the facility to undertake other work without being washed down first;
  - A purpose-designed wash bay should be established to ensure that equipment leaving the facility can be cleaned before such departure;

- All personal at all areas should be trained in spill response protocols. In the event of a spill, cleanup teams should be dispatched immediately. Appropriate equipment to rapidly affect such cleanup should be available and able to be readily mobilised;
- Trucks and other vehicles leaving the storage facility must have their wheels checked and cleaned of any sulphur residue; and
- The storage shed vehicular access points must be kept free of sulphur residue that could be entrained with vehicle movements.

- **Sulphur contaminated runoff:**
  - All previously mentioned mitigation measures relating to the prevention and cleanup of accidental spillages, the control of sulphur dust, washbays and bunding/containment of runoff for treatment are relevant;
  - Rössing Uranium should limit, as far as possible, the contamination of water, through the use of air compressors and vacuum cleaners to undertake the cleaning of plant and equipment, without causing a dust generation problem; and
  - Installation of a water treatment system prior to discharge, with separated sulphur to be transported to the mine for disposal and cleaned water stored for fire extinguishing purposes.

The way forward

This draft version of the SEIA Report for Rössing Uranium's proposed sulphur handling facility in the Port of Walvis Bay is being released for review and comment by I&APs, stakeholders and authorities. A comment period of 4 weeks is being provided and the Draft SEIA Report is being made available in Walvis Bay and Windhoek. Once all the comments and concerns raised have been considered and incorporated in the final SEIA Report, it will be submitted to MET:DEA for their decision-making.

In considering this SEIA Report, MET:DEA will ascertain whether the process undertaken is acceptable and whether there is adequate information to allow for an informed decision. Should the above be acceptable, they will need to decide on the social and environmental acceptability of the proposed project. MET:DEA's decision will be documented by a clearance of the project that will detail the decision and describe any conditions they might impose. Following the issuing of the MET:DEA clearance, their decision will be communicated by means of a letter to all registered I&APs and stakeholders.

As the environmental practitioners responsible for leading this SEIA process, Aurecon are of the opinion that the proposed project being assessed and applied for, namely the sulphur handling facility in the Port of Walvis Bay, should be positively received by MET:DEA and that an environmental clearance should be issued. This opinion is based on our comprehensive understanding of the environmental impacts likely to result from the sulphur handling activities as detailed in this and preceding documentation, and that the alternatives and mitigation measures as described and recommended will reduce the identified environmental impacts to an acceptable level.

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Personal Communications

Birdsey, N. Managing Director, Motomo Projects (Pty) Ltd, Kruin Street, Edenglen, Germiston, South Africa

Schneeweiss, R. Superintendent Land Use, Rössing Uranium, Private Bag 5005, Swakopmund, Namibia.

ANNEXURE A: APPLICATION FOR REGISTRATION AS AN INSPECTION AUTHORITY IN TERMS OF THE LABOUR ACT, 1992

NINHAM SHAND

FOUNDED IN 1932

CONSULTING SERVICES

Suite 201 Bloemhof Building
65 York Street, George, 6529
P O Box 509, George, 6530
South Africa

Tel: +27 44 874 2165
Fax: +27 44 873 5843
Email: enviro@shands.co.za
Website: www.shands.co.za

21 July 2008

Our ref : 402239/8.1464

Permanent Secretary
Ministry of Labour and Social Welfare
Private Bag 19005
Windhoek
Namibia

Attention : Mr Gerome Alberto van Wyk
Email : gavanwyk@hotmail.com

Dear Sir

SOCIAL & ENVIRONMENTAL IMPACT ASSESSMENT (SEIA) FOR RÖSSING URANIUM MINE'S EXPANSION PROJECT: BULK SULPHUR STORAGE AND HANDLING AT WALVIS BAY PORT – application as inspection authority

Ninham Shand has been appointed by Rössing Uranium to undertake an SEIA for their proposed bulk handling and storage facility in the Port of Walvis Bay. It has come to light that due to the fact that this is facility is classified as a "factory", Ninham Shand, as the Environmental Consultant for the project, must register as an inspection authority with the Ministry of Labour & Social Welfare.

To this effect, we hereby enclose our application form and supporting documentation, and wish to confirm that Allan Brett Lawson is permanently employed by Ninham Shand (Pty) Ltd as an Associate and is heading this impact assessment as Project Manager.

As confirmed telephonically, no physical work will be undertaken by ourselves on site. Our appointment is to assess the potential impacts of the proposed facility on the affected environment and document this in a series of reports for MET:DEA to consider and make a decision regarding an environmental clearance.

We trust that enough information has been supplied to enable you to register Allan Brett Lawson as an approved inspection authority with your Ministry. However, should you require any further information, or clarity regarding our application, please do not hesitate to contact us.

Yours sincerely
NINHAM SHAND

BJH JACOBS *Pr Eng*
Director:George Branch Manager
Encl.

REPUBLIC OF NAMIBIA

MINISTRY OF LABOUR AND SOCIAL WELFARE

Tel.: 061- 2066111
Fax: 061- 210047

Private Bag 19005
32 Mercedes Street, Khomasdal
WINDHOEK

Enquiries.: .....

Our Ref.: ..... Your Ref .....

LABOUR ACT, 1992

APPOINTMENT OF APPROVED INSPECTION AUTHORITIES

In terms of regulation 18 of the regulations relating to Health and Safety
of Employees at Work made under the Labour Act, 1992 (Act 6 of 1992)

TO: The Permanent Secretary
Ministry of Labour
Private Bag 19005
32 Mercedes Street, Khomasdal
WINDHOEK
NAMIBIA

ATT: The Chief Inspector: Occupational Health and Safety
Tel: (061) 2066111 Fax: (061) 212323

I/(We) NINHAM SHAND (PTY) LTD.
.....
.....

All official correspondences must be addressed to the Permanent Secretary

Hereby apply for appointment and registration as an approved inspection authority in terms of regulation 18 of the regulations relating to Health and Safety of employees at work.

1. Surname
   LAWSON

2. First Name
   ALLAN BRETT

3. Male [X] ; Female [ ] ; Unmarrie [ ] ; Marrie [X]
   Date of Birth
   15 JULY 1954

4. Place and Country of birth
   MACLEAR, SOUTH AFRICA

5. Citizenship
   SOUTH AFRICAN

6. ID. No.
   5407115503908 6

7. Postal Address
   PO Box 509
   GEORGE, SOUTH AFRICA
   6530.

8. Business Telephone No. +27-44-8742165
   Home Telephone No. +27-44-8708667

9. Fax No. +27-44-8735843
   e-mail address brett.lawson@shands.co.za

All official correspondences must be addressed to the Permanent Secretary

10. Safe field of Competency/ies

ISO 9000 TECHNICAL AUDITING: ENVIRONMENTAL.

11. **EDUCATION BACKGROUND**

University, Colleges & other Institutions	Qualification	Country and City	From		To		Mayor Subjects
			Month	Year	Month	Year	
(1) UNIVERSITY OF CAPE TOWN	MASTER OF ARTS - ENVIRONMENTAL & GEOGRAPHICAL SCIENCE	CAPE TOWN - SOUTH AFRICA	JAN.	1993	FEB.	1996	EIA.

All official correspondences must be addressed to the Permanent Secretary

.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....

12. WORKING EXPERIENCE

Employer	Post Held	Country	From		To		Remarks
			Month	Year	Month	Year	
MINHAM SHAW	ASSOC.	NAMIBIA RSA.	OCT.	2004	PRESENT.		.....
TEP.	DIRECTOR	MOZAMBIQUE RSA.	JULY	1998	AUG.	2004	.....
BOHLWEKI	CHIEF CONSULTANT	RSA.	JAN.	1995	JUNE	1998	.....
ESKOM	ADVISOR	USA. RSA	NOV.	1990	NOV.	1995	.....
NAT. PARKS	WARDEN	RSA.	JUNE	1975	OCT.	1990	.....
.....	.....	.....	.....	.....	.....	.....	.....

13. ADDITIONAL INFORMATION REQUIRED

- Company profile in brief (separate paper)
- CV in details
- Work permit (non citizen)
- Appointment letter from employer

Inspector handling the application

Signature: ..... Date:
.....

Recommended/Not recommended:

.....
.....
.....
.....

Chief Inspector

Approved / Not Approved:

.....
.....
.....
.....
.....

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REPUBLIC OF NAMIBIA

MINISTRY OF HOME AFFAIRS

DEPARTMENT OF CIVIC AFFAIRS
IMMIGRATION CONTROL ACT, 1993
VISA FOR THE REPUBLIC OF NAMIBIA
(Section 12/Regulation 11)

Reference no.

Permission is hereby granted to:

Surname: Lawson

First names: Allan Brett

Holder of following passport:

(a) Number: 4136946279 (b) Issuing authority: SA

(c) Place of issue: SA (d) Date of issue: 2008.10.03

(e) Date of expiry: 2013-10-02

to proceed to the Republic of Namibia subject to the following conditions:

1. Number of visa: W5456/2008
2. Date of issue: 2008.04.23
3. Date of expiry: 2008.07.31
4. Type of visa: Transit ☐ Single ☐ Multiple ☒
5. Further conditions:
   (a) Holder has to comply with entry conditions at port of entry
   (b) See Next Van der Merwe A 44950608 Work visa: Ninham Shand - only
6. Remarks: De Waal G. 4504776981, Killick P.J. 4209240228

The holder of this visa has to submit it to the immigration officer at the port of entry when applying for entry into Namibia and has to -

(aa) surrender this visa to the immigration officer in exchange for a visa to be stamped in his or her passport; or

(bb) retain the visa.

[delete either (aa) or (bb)]

visa fees paid: N$ 920.00

MINISTRY OF HOME AFFAIRS
WINDHOEK

Issued

Photograph of holder

MINISTRY OF HOME AFFAIRS Private Bag 13200 WINDHOEK 23 APR 2008 Aliens Control No. 1 Department of Civic Affairs

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Printed at 705764

NINHAM SHAND

FOUNDED IN 1932

CONSULTING SERVICES

GENERAL PROFILE

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NINHAM SHAND – ENGINEERING A BETTER TOMORROW TODAY

NINHAM SHAND'S MISSION STATEMENT

We serve our Clients and the wider community by providing civil engineering consulting and related expertise through our skilled and motivated staff who gain pleasure and purpose by striving for excellence in meeting the needs of those affected by projects for which we are retained.

We subscribe to the principle of environmentally sustainable development.

GENERAL OVERVIEW OF THE FIRM

With 75 years of experience, Ninham Shand Consulting Services is an established leader in the engineering profession, providing a comprehensive consulting service in virtually every field of civil, structural and environmental engineering. Sixteen offices throughout southern Africa, and a staff complement of over 560 professional engineers, technical personnel and support staff, ensure that the firm has the capacity and experience to undertake a large diversity of projects.

Control is vested in a directorate consisting of professional engineers who are independent of external interests. A high standard of time and cost management and quality control is maintained, ensuring that projects are produced on time, within budget and to the highest standard. The firm is currently utilising an ISO 9001:2000 certified Quality Management System.

The firm was founded in Cape Town in 1932 by Ninham Shand, the man who first envisaged the Oxbow Scheme (now the Lesotho Highlands Water Project). He played a leading role in the profession and established a reputation for high professional standards and innovative thinking. Mr Shand's distinguished career spanned almost 50 years and set the direction for the company as it is today.

NINHAM SHAND – THE ORGANISATION

Management Structure

The overall control of Ninham Shand (Pty) Ltd is vested in a Directorate which is independent of external interests.

The ownership of the firm lies with its shareholders who are all employees of the firm. Additional information on the firm's empowerment initiatives with regard to firm ownership may be found under the section "Affirmative Action and Transformation at Ninham Shand".

The Board of Ninham Shand (Pty) Ltd provides business and strategic leadership to the firm and determines policies that are to be implemented. The Board of Directors meets tri-annually.

Operational Structure

Ninham Shand's structure is designed to:

- achieve the best possible service to our Clients
- strengthen close personal contact and trust between Clients and the firm through top level staff in each region and the specialist spheres of work

- assist in the promotion and development of our consulting practice
- improve the management of the firm by assigning maximum responsibility and authority to regional and specialist operations.

With the changing needs of the market and the communities we serve, the range of the firm's expertise is dynamic and is adapted to meet these needs.

COMPANY AND PROFESSIONAL REGISTRATIONS / AFFILIATIONS

Ninham Shand (Pty) Ltd is a South African registered Private Company.

Ninham Shand (Pty) Ltd has been a member of the **South African Association of Consulting Engineers (SAACE)** since 1 March 1997, when membership by firm was established. Partners and Directors of Ninham Shand had been individual members of the SAACE since 1969.

THE SERVICES OFFERED BY NINHAM SHAND

Engineering Disciplines and Services

The broad discipline categories covered by Ninham Shand include:

ENVIRONMENTAL
including
- Integrated Environmental Management
- Environmental Impact Assessments
- Environmental Management Plans
- Social Impact Assessments

TRANSPORTATION
including
- Transportation Planning
- Traffic Engineering
- Roads (urban, rural and highways)
- Road Rehabilitation, Management and Maintenance
- Parking and Pedestrian Facilities
- Airports
- Railways
- Pavement Engineering and Management

URBAN AND RURAL DEVELOPMENT
including
- Bulk Earthworks and Land Shaping
- Township Services
- Water and Sewerage Reticulation and Network Analysis
- Stormwater Reticulation and Management
- Housing
- Siteworks to Commercial, Industrial and Institutional Developments
- Sports Facilities, Recreation Areas and Parks
- Urban Streets
- Solid Waste Management

WATER RESOURCES AND SUPPLY
including
- Natural Resource Planning
- Water Resources Planning
- Catchment Management
- Water Quality Studies and Monitoring
- Groundwater Exploitation
- Water Supply, Storage and Distribution
- Hydraulics (rivers, open channels, bridges, culverts and modelling)
- Hydrology (surface water and flood)
- Agricultural Engineering
- Irrigation
- Pumps and Pumpstations
- Pipelines
- Canals
- Erosion Control and Protection
- Sedimentation Studies

WATER AND WASTEWATER TREATMENT
including
- Potable Water Treatment
- Industrial Water Treatment
- Municipal Wastewater Treatment
- Industrial Effluent Treatment
- Optimisation of Wastewater Treatment Works
- Sludge Handling and Disposal
- Sewage Disposal and Reticulation
- Outfall Sewers
- Water Stabilisation
- Corrosion Control
- Odour Control

BUILDINGS / STRUCTURES
including
- Foundations and Basements
- Materials Technology
- Property Development
- Buildings and High-Rise Structures
- Residential, Commercial, Educational, Institutional, Industrial, Manufacturing, Public and Leisure Buildings
- Reservoirs, Water Towers and Water Storage Structures
- Process Service Structures
- Agricultural Structures
- Sporting Facilities
- Special structures (testing facilities, floating facilities, guidance masts)
- Bridges for Roads, Rail, Pedestrian and Water
- Recycling of Buildings
- Inspection and Rehabilitation of Structures

HEAVY CIVIL ENGINEERING
including
Dams (earthfill, rockfill, concrete, rollcrete, gated and ungated spillways, outlet towers, tunnels and works)
Geological and Geotechnical Engineering
Tunnels
Hydroelectric Power
Pump Storage Power Supply Schemes

Our services are diverse and include the following:

Problem Analysis, Concept Development, Master Planning, Feasibility Determination, Economic Evaluations, Design, Contract Preparation, Contract Administration, Construction Management, Quality Monitoring, Expert Evidence in Litigation and Technical Advice in Insurance.

Other ancillary services include:

Mediation, Arbitration, Computer Software Development, Community Liaison, Skills Training, Surveying and Materials Testing at our Geotechnical laboratories in Cape Town, Bloemfontein and Johannesburg.

AFFIRMATIVE ACTION AND TRANSFORMATION AT NINHAM SHAND

The Apartheid policies that were practiced and enforced in South Africa until the universal democratic elections of 1994 have left a legacy of disparities in education and economic empowerment between race groups. Since 1994 the South African Government has set in place legislation and programmes to redress the imbalances of the past, one of the most important of these being the "Employment Equity Act" of Parliament.

Ninham Shand is proud of its proven track record in the field of affirmative action and empowerment. Prior to the 1994 elections, the firm had for many years conducted itself as an equal opportunity company and had recruited from all sections of the community. This entailed ongoing support by the firm of in-house technical training and formal continued education of staff from disadvantaged backgrounds with career advancement being based on performance irrespective of gender, race or creed.

With the promulgation of the Employment Equity Act, the firm's Affirmative Action Committees that had been elected in the main offices were re-established as Employment Equity Committees.

The responsibility for implementing the requirements of the Employment Equity Act rests with the Managing Director and the Board of Ninham Shand. A Human Resource Development Officer was appointed in July 1999 with a primary task being the implementation of the requirements of the Act.

The Board has affirmed its commitment to the policies of employment equity.

"We at Ninham Shand believe that embracing diversity in our organisation is the key to our future survival. To quote our former President Nelson Mandela when he said

"..Just as there is no easy walk to freedom, so there is no simple ride to equality. We have to work for it, calmly, intelligently and in a principled way. Affirmative action is the principled means of dealing in as just and realistic a manner

possible with the progressive eradication of the gulf created by past discrimination between black and white, men and women"

With this in mind our Employment Equity policy has been developed as an extension of our core values, not only to ensure the fair and equitable treatment of all our staff but also to involve all our employees in the successful transformation and development of our society.

The Employment Equity policy includes numerical goals for achieving equitable representation within occupational categories and levels, as well as measures to eliminate employment barriers and promote diversity, including initiatives to train, develop and retain designated employees.

We believe our Employment Equity Policy will achieve a diverse workforce more broadly representative of our society. This will not only promote broader economic development but also enhance the productivity of our workforce."

- Statement by the Board of Ninham Shand

Representation within the firm

Ninham Shand has for many years applied non-discriminatory policies with regard to employment, promotion and development of staff. As many consulting engineers have found, progress in recruitment and promotion of engineers from historically disadvantaged backgrounds has been hampered by the small numbers of engineers emerging from these backgrounds. Nevertheless, progress is evident, and a continuous sustained effort is being made to achieve meaningful representation by race and gender across all levels in the firm.

The work environment and facilities of Ninham Shand are designed around the rational and efficient usage of resources. The firm supports, and will continue to support, equal opportunities for its entire workforce. The policies of the firm have always been non-discriminatory with regard to the other areas outlined in the Employment Equity Act, such as remuneration, working environment and facilities, fair treatment, disclosure of information and training opportunities.

More than 55% of the firm's staff are Historically Disadvantaged Individuals (HDIs).

School Involvement

Only three to four percent of registered professional engineers in our country come from historically disadvantaged groups, and very few current school leavers have taken the school subjects that will enable them to select technical careers. Ninham Shand realised the urgent need to become involved in changing this state of affairs at a basic level. Supporting students in the choice of maths and science should eventually widen the resource pool of engineers and scientists.

To this end we have an integrated approach at regional and national level, whereby we become involved in schools and also offer bursaries to students at both school and tertiary level.

Education and Training

Ninham Shand is committed to the development of the designated group (historically disadvantaged individuals) and the provision of appropriate training opportunities; we believe that empowerment is made possible through the provision of skills and training. We have one of the most extensive bursary programmes in the consulting engineering industry in South Africa. Our

bursary programme provides sponsorship to both Technikon and University civil engineering students, focusing on the provision of bursaries to the designated group.

Our policy is to provide the maximum amount of support according to the financial need of each student. We link our bursaries wherever possible to our school partnership programme.

We also provide various prizes at tertiary educational institutions for excellent performance, and give presentations on areas of concern to students and employers, including life skills and work expectations.

In addition to the above, we have an in-service training programme with Technikons.

Staff Training

In addition to bursaries and student training programmes, Ninham Shand has a policy of providing training and development to its entire staff within the organisation. One of the roles of the Human Resource Development Officer is to ensure that all staff are given such opportunities in order to reach their maximum potential. Staff are also given the chance to work in different departments and sections to expand their expertise. In line with the firms commitment to Affirmative Action and the upliftment of historically disadvantaged people within the organisation, special budgets are allowed in each office, as well as corporate budgets for internal training of designated and non-designated individuals. Accelerated career path development of talented designated group staff is given high priority.

Community Support

Ninham Shand is committed to the empowerment and upliftment of historically disadvantaged communities through involvement in and support of various community initiatives. Financial support is considerable, and Ninham Shand staff have spent thousands of hours of personal time without gain in providing community support and assistance with a variety of projects.

Empowerment

Ninham Shand has provided support for a number of small businesses. In addition, the firm has contributed to the development of many successful professionals who spent a portion of their developing careers gaining experience at Ninham Shand.

Ninham Shand is a strong, diverse organisation which remains committed to ongoing empowerment. It takes great pride in its representative workforce and also wants this representation to be reflected in the firm's ownership. Ninham Shand is an employee-owned company which has embarked on a programme to broaden and deepen its shareholding and has thereby achieved participation by over 100 employees. More recently, it has been decided to increase further participation by employees to nearly double this number. Through a Black Economic Empowerment (BEE) Trust, and in terms of a share scheme, the acquisition of shares by Historically Disadvantaged Individuals is being accelerated. Under this economic empowerment scheme, employees who are historically disadvantaged individuals have achieved 33.35% ownership in Ninham Shand Holdings (Pty) Ltd, thus ensuring that Ninham Shand is representative of South Africa's rich cultural heritage both in terms of its employee composition and ownership structure.

QUALITY ASSURANCE AT NINHAM SHAND

Quality Assurance constitutes all the planned and systematic actions that are necessary to provide adequate confidence that the required quality will be achieved in executing assignments for which the firm has been appointed. The purpose of this section of the submission is to describe and explain Ninham Shand's quality assurance activities, thereby giving our prospective client confidence in the firm's capacity to successfully complete assignments for which it is appointed. Ninham Shand is proud that the name of the firm has by many of its clients come to be associated with the delivery of a quality service. This is due in part to the legacy of the firm's founder, Ninham Shand, who started his consulting practice in 1932. He played a leading role in the profession and established a reputation for high professional standards and innovative thinking. As a one-man operation he at that early stage neither had, nor indeed needed, voluminous procedures, manuals or codes of practice. It was his own technical ability, experience and personal care and concern that ensured the maintenance of reputable standards of engineering and client satisfaction.

Ninham Shand still places a particular emphasis on the experience, expertise and capabilities of its staff and on the suitability, reliability and sustainability of the services they provide. However, as the firm developed and grew beyond small beginnings there was a need for the adoption of procedures and systems to ensure uniformity, and the maintenance of high professional standards of service.

These procedures and systems have evolved over time and are now incorporated in a Quality Management System (QMS) developed in terms of the requirements of ISO 9001.

All activities critical to the standard of service provided by Ninham Shand have been identified, and procedures covering those activities have been drafted and included in the Quality Management System. All of the approximately 560 staff members of the firm working in 16 offices throughout Southern Africa are required to apply the Quality Management System procedures to the execution of their work, and in the process, provide documentary evidence that the required level of quality management has been attained.

In its current form, the Ninham Shand Quality Management System consists of twenty-eight procedures. Six of these procedures are System Procedures that apply to the management of the quality management system itself. The System Procedures are; Preparation of Procedures, Internal Quality Audits, Management Review, Quality System Document Control, System Nonconformities and Process Nonconformities.

The balance of the procedures is Process Procedures that apply to the project realisation process, the presentation of the project outputs project administration and projects under construction.

The Process Procedures that apply to the product realisation process to the project are; Appointment Review, Project Quality Plans – Large Projects, Project Quality Plans – Small Projects, Design Control, Design Change Control, Supplier Control, Calculations and Performance Assessment.

The Process Procedures that apply to the presentation of the output of the project process are; Reports, Drawing Control, Tender Documents and Standard Drawing Control.

The Process Procedures that apply to the administration of the project process are; Correspondence Control, E-mail Communications, Filing Control, Telephone Conversation Records, Equipment Control and Archiving.

The Construction Monitoring Procedures that applies to projects under construction are; Construction Administration, Construction Monitoring and Monthly Site Reporting.

Although all relevant procedures carry equal importance in the completion of an assignment, it is the preparation and implementation of project quality plans for either small or large projects that are considered the most important activity for the delivery of a quality product. It is through the application of the project quality plan procedure that clients receive assurance that their project is receiving individual attention with respect to the specific quality practices, resources and sequence of activities that will apply to its execution.

The management responsibility for the implementation of the Quality Management System is defined in Quality Management System Document. A Standing Committee on Quality (consisting of a Quality System Manager and three board members) represents and acts on behalf of the firm's board on quality matters.

A Quality System Manager reports to the Standing Committee on Quality and has the overall responsibility for ensuring, amongst other quality tasks, that the Quality Management System is implemented and maintained in accordance with ISO 9001. Designated Quality Representatives in each of the business units monitor the application of the Quality Management System at an office level.

Regular internal audits, in addition to those external audits required in order to obtain and retain ISO 9001 certification, are carried out to confirm that the Quality Management System is being implemented correctly and effectively.

Ninham Shand first obtained its ISO 9001: 2000 certification through BVQI in December 2001.

INFORMATION TECHNOLOGY AND DATA SYSTEMS AT NINHAM SHAND

Computer Systems and Capabilities

Ninham Shand ensures that the information technology systems and programmes it utilises for its work are based on the best available technology, thereby providing the client with an efficiently produced and accurate product.

An Information Technology (IT) Manager within the firm ensures that the firm's information technology policies are applied throughout the firm. In order to apply its resources more effectively to its core business, the firm has followed a policy of outsourcing to third parties the support it requires for desktop, network and other specialist services.

All offices in the firm are equipped with Local Area Networks (LAN) in which desktop computers are linked to each other and a network server on which project and administrative data is stored. The firm's offices are linked by means of a Wide Area Network (WAN).

Technical staff utilise desktop computers in the preparation of calculations, drawings and documents relevant to the planning, design and construction administration of engineering projects. Administrative staff utilise the technology for word processing and accounting, either for the production of reports or documents for project outputs, or as part of the general administrative functions of the firm.

Computer peripherals linked to the networks in the offices include printers, plotters and scanners. Project output is sometimes required in digital form, in which case the data is transferred to CD by means of a CD writer.

Ninham Shand takes great care to ensure the integrity of the data developed for its clients, endeavouring to protect the data against loss or corruption. Anti-virus software is installed on network and/or desktop computers. Appropriate steps have also been taken to prevent access to the firm's computer networks by unauthorised parties. Project and administrative data on network servers and/or desktop computers is 'backed-up' on a regular basis (in most cases daily) to storage media, so that critical data that may lost on the servers and /or desktop computers due to hardware failure or data corruption can be restored.

Software utilised by the firm includes proprietary packages for word processing, the creation of spreadsheets, the design of roads and water and sewer networks, drafting, the creation and maintenance of databases and geographic information systems (GIS) and accounting. In some cases, Ninham Shand has also developed engineering and project management software for its clients and has also provided training where necessary. Training is provided to staff where necessary to ensure that they are able to utilise the firm's computer hardware and software effectively in the performance of their duties.

Library and other data sources

Ninham Shand maintains a substantial technical library, which is managed by a librarian. The library contains a large collection of current technical and reference books including various National and International Standards and Codes of Practice and suppliers' catalogues. The firm subscribes to many organisations which issue technical papers from time to time summarising recent advances in technology, and these papers are also included in the library. Accession lists are regularly issued to the entire staff advising them of new additions to the library.

Ninham Shand also subscribes to outside libraries, databases and indexes and through affiliations with associated and specialist companies and individual specialists at SA Universities have access to the most recent technology. In addition, other firms, manufacturers, suppliers, trade organisations, universities and institutions are used to supplement the information available to the firm.

Designated discipline group leaders ensure that staff members with particular expertise or experience in a technical subject or related subjects are identified and charged with keeping abreast of new developments and the availability of relevant reference documents.

CURRICULUM VITAE

Name of Firm	**:**	Ninham Shand (Pty) Ltd
Name of Staff	**:**	Allan Brett Lawson
Profession	**:**	Associate
Year of Birth	**:**	1954
Years with Firm	**:**	2
Nationality	**:**	South African

MEMBERSHIP OF PROFESSIONAL SOCIETIES:

- Registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (Reg No 400106/04).
- Certified as an Environmental Assessment Practitioner with Environmental Assessment Practitioners of South Africa (EAPSA).
- Member of the International Association for Impact Assessment South African Affiliate (IAIAsa). (Ex-Chair, Western Cape Branch and presently national President.)
- Member of the Game Rangers Association of Africa (GRAA).

KEY QUALIFICATIONS:

Brett Lawson has an MA in Environmental and Geographical Science, as well as diplomas in wildlife management, business management, environmental management and environmental auditing. He spent 12 years in wildlife management and research with conservation agencies in southern and South Africa, and nine years in the more holistic field of environmental management in the National Lake Areas and Eskom. He was one of the founders in 1995 of Bohlweki, the first emergent environmental consultancy established in South Africa, and later started The Environmental Partnership which he relinquished in 2004 as a fully empowered environmental consultancy. He thus has considerable multi-disciplinary experience across the range of environmental sciences.

EXPERIENCE RECORD

1) Regulatory Processes and Environmental Impact Assessment:

2006	Project Manager	**Additional Units at the Open Cycle Gas Turbine Plant at Mossel Bay, Western Cape, South Africa:** Appointed by Eskom to manage a comprehensive and multi-disciplinary EIA process for three additional gas turbine units at the peaking generation power plant at Mossel Bay.

2006	Consulting team member	**Melkhoutfontein Landfill Site, Stilbaai, Western Cape, South Africa:** Appointed by Hessequa Municipality to manage an EIA process for a new landfill site, in collaboration with GeoStatus Engineering Geologists.
2006	Project Manager	**Emergency electricity generation at PetroSA Refinery, Mossel Bay, Western Cape, South Africa:** Appointed by Eskom to undertake a Scoping Checklist submission for the temporary installation of three 22 MW portable open cycle gas turbine electricity generating plants within the PetroSA Refinery site at Mossel Bay. The objective of the installation was to augment electricity generation in the Western Cape until permanent open cycle gas turbine plants are brought on line at Mossel Bay and Atlantis.
2006	Project Manager	**Coal-fired Power Station and Associated Infrastructure in the Witbank Area, Mpumalanga, South Africa:** Appointed by Eskom to manage a comprehensive and multi-disciplinary EIA process for a new 5 400 MW base-load power plant and associated infra-structure.
2005	Project Manager	**Baden Powell Drive realignment project, Cape Town, Western Cape, South Africa:** Appointed by the City of Cape Town to undertake a Scoping Checklist submission, which includes an Environmental Opportunities and Constraints Report and comprehensive public participation, for the realignment of a Class 1 Expressway. The realignment is one of the City of Cape Town's Urban Renewal Programme projects.
2005	Project Manager	**Open Cycle Gas Turbine power plant, fuel supply pipeline, substation and transmission lines, Mossel Bay, Western Cape, South Africa:** Appointed by Eskom to manage a comprehensive and multi-disciplinary EIA process for a new peaking generation power plant and associated infrastructure.
2004	Project Manager	**Helderstroom Prison upgrade, Caledon, Western Cape, South Africa:** Appointed by Dept of Public Works to undertake a Scoping-level EIA for new and replacement housing, recreational facilities and fuel station.
2004	Project Manager	**Kraaifontein residential development, Western Cape, South Africa:** Appointed by EGT Developers to undertake a Scoping Checklist submission for rezoned agricultural land.
2002	Project Manager	**Liesbeek River canal rehabilitation, Cape Town, Western Cape, South Africa:** Appointed by City of Cape Town to undertake an EIA for rehabilitation of Liesbeek River canal.
2002	Project Manager	**Blue Downs Police Station, Western Cape, South Africa:** Appointed by Dept of Public Works to undertake an EIA for a new police station.
2001-2003	Project Manager	**Table Mountain National Park's Glen, Boulders and Constantia Nek facilities, Cape Town, Western Cape, South Africa:** Appointed by SANParks to undertake IEM processes for redevelopment of tourist amenities.
2001	Project Manager	**Helderberg 132/11 kV substation, Western Cape, South Africa:** Appointed by Helderberg Municipality to undertake EIA for new substation.
2001	Project Manager	**Kuilsrivier housing development, Western Cape, South Africa:** Appointed by private developer to undertake EIA for Bardale Village economic housing project.

2000	Project Manager	**Hazeldean Housing Development, Western Cape, South Africa:** Provided pro bono service in undertaking EIA for community-based housing project.
2000	Project Manager	**Cape Town International Convention Centre, Cape Town, Western Cape, South Africa:** Appointed in association by private/provincial partnership to undertake EIA for new world-standard convention centre.
2000	Project Manager	**Saldanha - Vredenberg 66 kV powerline, Western Cape, South Africa:** Appointed by local authority to undertake EIA for new electricity distribution powerline.
2000	Project Manager	**Siemens cellphone mast sites, Western Cape, South Africa:** Appointed by service provider to undertake EIAs for third cellphone licence at seven mast sites.
2000	Project Manager	**Gordons Sports Institute, Western Cape, South Africa:** Appointed by private developer to undertake EIA for redevelopment of sports complex.
1999	Specialist on consulting team	**Gurue – Lichinga 110 kV powerline, Mozambique:** Appointed by Scandinavian development agency to apply specialist EIA methodology in undertaking of EIA for new electricity distribution network in northern Mozambique.
1999	Project Manager	**Cape Town International Airport Precinct 2, Cape Town, Western Cape, South Africa:** Appointed by Airports Company of South Africa to undertake EIA for industrial development on their landholdings
1999	Project Manager	**Kraaifontein urban development, Western Cape, South Africa:** Appointed by private developer to undertake EIA for mixed urban development in greenfield area.
1999	Project Manager	**Rooiels residential development, Western Cape, South Africa:** Appointed by private landowner to undertake EIA for new residence in coastal settlement.
1999	Project Manager	**Suikerbossie development, Hout Bay, Western Cape, South Africa:** Appointed by private developer to undertake EIA for redevelopment of restaurant and conference facility.
1999	Project Manager	**Milnerton Racecourse redevelopment, Cape Town, Western Cape, South Africa:** Appointed by private developer to undertake EIA for redevelopment of racecourse for mixed urban use.
1998	Project Manager	**Somerset Square development, Somerset West, Western Cape, South Africa:** Appointed by private developer to undertake EIA for development of new residential precinct.
1998	Project Manager	**Longbeach Mall, Noordhoek, Western Cape, South Africa:** Appointed by private developer to undertake EIA for development of new commercial complex.
1998	Project Manager	**Noree 66/11 kV substation, Western Cape, South Africa:** Appointed by local authority to undertake EIA for new substation in rural area.

1998	Project Manager	**Wynberg traffic alleviation study, Western Cape, South Africa:** Appointed by South Peninsula Municipality/Cape Metro Council to undertake EIA for proposed arterial bypass through heavily urbanised area.
1997	Project Manager	**Myrtle Grove Wine Estate, Western Cape, South Africa:** Appointed by private developer to undertake EIA for residential component and expanded processing facilities on wine farm.
1997	Project Manager	**Ottery/South/Constantia Road, Cape Town, Western Cape, South Africa:** Appointed by South Peninsula Municipality/Cape Metro Council to undertake EIA for proposed arterial route through heavily urbanised area.
1997	Consulting team member	**Vanguard Drive, Cape Town, Western Cape, South Africa:** Appointed by City of Cape Town to undertake IEM process for preliminary design of arterial road upgrading project
1997	Consulting team member	**Sheffield – Symphony Road, Cape Town, Western Cape, South Africa:** Appointed by City of Cape Town to undertake IEM process for new arterial road alignment.
1996	Consulting team member	**Blackheath transport interchange, Western Cape, South Africa:** Appointed by City of Cape Town to undertake IEM process for transport modal interchange at railway station and taxi rank.
1996	Consulting team member	**Kaalfontein residential development, Gauteng, South Africa:** Appointed by private developer to undertake EIA for new residential precinct in greenfield area.
1993	Environmental advisor	**Waenhuiskrans electricification, Southern Cape, South Africa:** Provided environmental sensitivity report for electrification of underdeveloped fishing village.
1992	Environmental advisor	**Knysna – Robberg 66 kV powerline, Southern Cape, South Africa:** Undertook EIA for new powerline through rural area.
1992	Environmental advisor	**Rietvlei – Plattekloof 132 kV powerline, Western Cape, South Africa:** Undertook EIA for new powerline in peri-urban area.
1992	Environmental advisor	**Kraaifontein – Scottsdene 66 kV powerline, Western Cape, South Africa:** Undertook EIA for new powerline peri-urban area.
1992	Environmental advisor	**Caledon – Jagersbos 66 kV powerline, Western Cape, South Africa:** Undertook EIA for new powerline through rural area.
1991	Environmental advisor	**Woodville – Wilderness 66 kV powerline, Southern Cape, South Africa:** Undertook EIA for new powerline through rural area.
1991	Environmental advisor	**Blue Downs – Firgrove 132 kV powerline, Western Cape, South Africa:** Undertook EIA for new powerline through peri-urban area.

2) Environmental Management Plans:

2006	Project Manager	**Open Cycle Gas Turbine power plant, fuel supply pipeline, substation and transmission lines, Mossel Bay, Western Cape, South Africa:** Appointed by Eskom to compile an EMP for the construction of a new peaking generation power plant and associated infrastructure.

2005	Environmental Monitor	**Berg River Dam Project, Western Cape, South Africa:** Appointed by Berg River Consultants to stand in for the Environmental Monitor responsible for performance monitoring of the application of the EMP for a significant dam construction project.
2002-2004	Project Manager	**Chapmans Peak Drive road rehabilitation, Western Cape, South Africa:** Appointed by Provincial Government to apply EMP and manage environmental monitoring committee.
2003	Project Manager	**Cape Town International Convention Centre, Cape Town, Western Cape, South Africa:** Appointed in association by private/provincial partnership to compile and apply EMP for construction of new world-standard convention centre.
2001	Project Manager	**Saldanha Port service corridor bridge, Saldanha, Western Cape, South Africa:** Appointed by Provincial Government to compile and apply EMP for construction of new bridge.
2001	Project Manager	**Vredenberg - Saldahna Road, Western Cape, South Africa:** Appointed by Provincial Government to compile and apply EMP for construction of new dual-carriageway.
2001	Project Manager	**Stellenbosch Arterial Road, Western Cape, South Africa:** Appointed by Provincial Government to compile and apply EMP for construction of upgraded dual-carriageway.
1998	Project Manager	**Arabella Golf Course, Hermanus, Western Cape, South Africa:** Appointed by private developer to compile and apply EMP for construction of new golf course.
1996	Project Manager	**Vredenberg - Paternoster Road, Western Cape, South Africa:** Appointed by Provincial Government to compile EMP for resurfacing of road.

3) Institutional and Policy Development and Professional Review Services:

2006	Project Manager	**Independent review of EIA for golf course development, Plettenberg Bay, Western Cape, South Africa:** Appointed by Department of Environmental Affairs and Development Planning to undertake independent review of EIA documentation and process for Roodefontein golf course/ residential development.
2005	Project Manager	**Independent review of EIA for golf course development, Malmesbury, Western Cape, South Africa:** Appointed by Department of Environmental Affairs and Development Planning to undertake independent review of EIA submission for Mount Royal golf course/ residential development.
2002-2004	Consulting team member	**Independent review of EIA/EMP for Chapmans Peak Drive road rehabilitation, Cape Town, Western Cape, South Africa:** Appointed by Provincial Government to provide independent review and advisory service for planning, approval and construction of road rehabilitation.
2002	Project Manager	**Independent review of powerline EIA, Northern Cape, South Africa:** Appointed by Eskom to undertake independent review of Oasis - Kanoneiland 66 kV powerline EIA process and documentation.

1999	Project Manager	**Independent review of landfill EIA, Hermanus, Western Cape, South Africa:** Appointed by Arcus Gibb to undertake independent review of EIA for new regional landfill site.
1998 – 2000	Project Manager	**Independent review of electricity distribution EIAs, Western Cape, South Africa:** Appointed by Eskom to undertake independent reviews of EIAs for 10 electricity distribution powerlines.
1996	Project Manager	**Strategic review of Eskom's Annual Report, South Africa:** Appointed by Eskom's Distribution Group to review environmental component of annual report from a strategic point of view.

4) Assessment of Water Resource Developments and Catchment Management:

2002	Specialist on consulting team	**Port of Durban Master Plan, Durban, KwaZulu Natal, South Africa:** Appointed by National Ports Authority to undertake environmental component of Master Plan formulation for Port of Durban.
2002	Project Manager	**Liesbeek River canal rehabilitation, Cape Town, Western Cape, South Africa:** Appointed by City of Cape Town to undertake an EIA for rehabilitation of Liesbeek River canal.
2000	Specialist on consulting team	**Faunal study for Zoarvlei management plan, Cape Town, Western Cape, South Africa:** Appointed by Blaauwberg Municipality to undertake specialist faunal study for Zoarvlei management plan formulation.
1988	Warden/ Ecologist	**Wilderness National Park Management Plan, Southern Cape, South Africa:** Developed *Procedure for Dealing with Beached or Stranded Marine Mammals* as component of Wilderness National Park Management Plan.

5) Specialist Facilitation, Public Processes, Training and Social Surveys:

2005	Project Manager	**Open Cycle Gas Turbine power plant, fuel supply pipeline, substation and transmission lines, Mossel Bay, Western Cape, South Africa:** Appointed by Eskom to undertake the public participation process for a comprehensive and multi-disciplinary EIA process for new peaking generation power plant and associated infrastructure.
2002	Project Manager	**Kalk Bay heritage assessment, Kalk Bay, Western Cape, South Africa:** Appointed by private developer to undertake the public participation process for redevelopment of New Kings and Majestic historic sites.
1998	Project Manager	**Krantzkop SEA, Wellington, Western Cape, South Africa:** Appointed by Somchem to undertake the public participation process for SEA of possible redevelopment of explosives manufacturing plant.
1997	Project Manager	**Wildevoelvlei waste water treatment plant, Western Cape, South Africa:** Appointed by City of Cape Town to undertake the public participation component of EIA for expansion of Wildevoelvlei treatment plant.
1996	Project Manager	**Bellville – Cape Town cycle path, Western Cape, South Africa:** Appointed by Cape Metropolitan Council to undertake the public participation process for proposed cycle path.

6) Environmental Planning:

2006	Consulting team member	**Alien Vegetation Eradication and Rehabilitation, Fancourt Estate, George, Western Cape, South Africa:** Appointed by Fancourt Golf and Country Estate to formulate an alien vegetation eradication and rehabilitation plan for their landholding on the Malgas River.
2005	Project Manager	**Taal Monument Security Fence, Paarl Mountain, Western Cape, South Africa:** Appointed by Dept of Public Works to formulate a Conservation Management Plan and construction guidelines for the erection of a new security fence around a cultural precinct.
2002	Specialist on consulting team	**Port of Durban Master Plan, Durban, KwaZulu Natal, South Africa:** Appointed by National Ports Authority to undertake environmental component of Master Plan formulation for Port of Durban.
2002	Specialist on consulting team	**Paarl Farms planning study, Western Cape, South Africa:** Appointed by Drakenstein Municipality to undertake biophysical component of forward planning study of farmland within Paarl urban area.
2002	Project Manager	**SEA for Lansdowne Road corridor, Cape Town, Western Cape, South Africa:** Appointed by City of Cape Town to undertake SEA for Lansdowne Road development corridor
2001	Specialist on consulting team	**Scenic Drive Network management plan, Cape Town, Western Cape, South Africa:** Appointed by City of Cape Town to undertake environmental component of Cape Town's Scenic Drive management plan formulation.
2001	Specialist on consulting team	**Avifaunal study for Paradyskloof powerline EIA, Western Cape, South Africa:** Appointed by Stellenbosch Municipality to undertake specialist avifaunal study for EIA process for Paradyskloof powerline project.
2000	Specialist on consulting team	**Faunal study for Zoarvlei management plan, Cape Town, Western Cape, South Africa:** Appointed by Blaauwberg Municipality to undertake specialist faunal study for Zoarvlei management plan formulation.
1998	Consulting team member	**Krantzkop SEA, Wellington, Western Cape, South Africa:** Appointed by Somchem as consulting team member for SEA of possible redevelopment of explosives manufacturing plant.
1998	Specialist on consulting team	**Conservation Management Plan for Krantzkop nature reserve, Wellington, Western Cape, South Africa:** Appointed by Somchem to formulate conservation management plan for landholdings surrounding explosives manufacturing plant, as component of SEA.
1995	Environmental advisor	**Salt River Powerstation decommissioning, Cape Town, Western Cape, South Africa:** Managed study of biological component for EIA of decommissioning of Salt River Powerstation.
1992-1994	Environmental advisor	**Fixed-point photographic monitoring, Western Cape, South Africa:** Undertook fixed-point photographic monitoring of revegetation of Gydo - Ceres 66kV powerline servitude.

1988	Warden/ Ecologist	**Wilderness National Park Management Plan, Southern Cape, South Africa:** Developed *Procedure for Dealing with Beached or Stranded Marine Mammals* as component of Wilderness National Park Management Plan.
1986	Ranger/ Ecologist	**Avifaunal monitoring, Southern Cape, South Africa:** Maintained individual locus lists for *A Checklist of the Birds of the Southern Cape.*
1982-1985	Ranger/ Ecologist	**Golden Gate Highlands National Park Management Plan, Free State, South Africa:** Undertook long-term ungulate population monitoring and maintained census records.
1981	Research technician	**Research methodology, Jonkershoek Research Station, Western Cape, South Africa:** Developed photomicrographic technique for carnivore scat analysis.
1980	Research technician	**Research methodology, Jonkershoek Research Station, Western Cape, South Africa:** Designed and applied collapsible fall-cage for carnivore capture.

7) Business/Corporate Environmental Services:

2003-2004	Consulting team member	**Environmental management system for toll road, Cape Town, Western Cape, South Africa:** Appointed by toll road operator to participate in design of EMS for Chapmans Peak Drive and implemented by means of Isometrix software application.
1997	Project Manager	**Environmental audits of landfill sites, Gauteng and Western Cape, South Africa:** Appointed by Waste-Tech to undertake audits of their landfill sites in Gauteng and Western Cape, South Africa.
1996	Consulting team member	**Environmental audit of Johannesburg International Airport, Gauteng, South Africa:** Appointed by Airports Company of South Africa to undertake an audit of land issues relevant to their international airport in Johannesburg.
1993-1995	Environmental advisor (team member)	**Environmental management system for electricity utility, Western Cape, South Africa:** Developed and initiated an EMS for Eskom's Cape Distributor, based on BS7750, ISO9000 and ISO14001.
1993-1995	Environmental advisor (team member)	**Environmental audits of electricity powerlines, Limpopo, Mpumalanga, Western Cape:** Undertook environmental audits of Eskom's Pietersburg - Phalaborwa and Palmiet - Mossel Bay transmission lines, as well as distribution lines in the Cape Distributor.
1993-1994	Environmental advisor (team member)	**Environmental audits electricity substations, KwaZulu/Natal, Mpumalanga and Gauteng, South Africa:** Undertook audits of Eskom's Marathon, Venus, Foskor and Newcastle main transmission system substations.
1993	Environmental advisor (team member)	**Environmental audits of powerstations, Gauteng, South Africa:** Undertook environmental audits of land issues relevant to Eskom's Arnot and Wilge powerstations.

8) Project Management:

2005	Project Manager	**Open Cycle Gas Turbine power plant, fuel supply pipeline, substation and transmission lines, Mossel Bay, Western Cape, South Africa:** Appointed by Eskom to project manage a comprehensive and multi-disciplinary EIA process for new peaking generation power plant and associated infrastructure.

COUNTRIES OF WORK EXPERIENCE:

Botswana, Mozambique, Namibia, South Africa.

EDUCATION:

TERTIARY

- MA in Environmental and Geographical Science, University of Cape Town, 1996.
- Diploma in Small Business Management, Potchefstroom University, 1989.
- BA in Geography, University of South Africa, 1985.
- Diploma in Nature Conservation and Wildlife Management, Pretoria Technikon, 1976.

IN-SERVICE TRAINING/ CONTINUING PROFESSIONAL DEVELOPMENT (* certificated)

Conservation management:

- Taxidermy
- Chemical immobilisation
- Skiboat Skippers licence *
- Restricted Marine Radio Operators licence *
- Herbicide application *

Business management:

- Personal computers *
- Management skills *
- Performance appraisal *
- Conflict management and mediation skills *

Environmental management:

- Negotiation skills *
- Integrated Environmental Management (UCT) *
- Study tour to Florida, USA (presented paper at EPRI conference & undertook research at electricity utilities)
- ISO 9000 Quality Management: Environmental Auditing*
- Architectural and Urban Conservation *

EMPLOYMENT RECORD:

2004 to date Associate, Ninham Shand Consulting Services, Cape Town, South Africa

1998-2004	Director, The Environmental Partnership, Cape Town, South Africa
1995-1998	Chief Consultant, Bohlweki Environmetal (Pty) Ltd, Cape Town, South Africa
1990-1995	Environmental Advisor, Eskom, Western Cape, South Africa
1985-1990	Senior Ranger/Warden, National Parks Board, Western Cape, South Africa
1982-1985	Ranger, National Parks Board, Free State, South Africa
1980-1982	Research Technician, Department of Nature and Environmental Conservation, Western Cape, South Africa
1975-1980	Conservator, Department of Nature and Environmental Conservation, Western Cape, South Africa
1974-1975	Game Ranger, Limshapo Game Conservation Syndicate, Botswana
1973	Field Technician, Mineral Services (Pty) Ltd, Namibia

LANGUAGES:

	Speaking	**Reading**	**Writing**
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

PAPERS AND PUBLICATIONS:

Lawson, A B 1997. Applying Sector-specific EIA Methods*: Lessons Learnt from Large Linear Developments*. Proceedings of the annual conference of the South African chapter of the International Association for Impact Assessment, Kwamaritane, September, 1997.

Lawson, A B 1996. *Environmental Impact Assessment in the Routing of High Voltage Overhead Transmission Lines: Theory and Practice in South Africa*. Unpublished MA Dissertation. University of Cape Town, 1996.

Lawson, A B 1995. *Environmental Impact Assessment within the Power Utility Industry in South Africa: the Distribution Group Perspective*. Proceedings of the 15th annual International Association for Impact Assessment conference, Durban, June 1995.

Lawson, A B 1993. *Monitoring Wildlife and Powerline Interactions in the Fynbos Biome*. In *Monitoring Requirements for Fynbos Management*, Marais, C & Richardson, D M (eds), Programme Report Series No. 11, FRD. (Short communication)

Lawson, A B & Wyndham, M J 1992. *A System of Monitoring Wildlife Interactions with Electricity Distribution Installations in a Supply Region of the Cape Province in Southern Africa*. Proceedings of the EPRI International Workshop on Avian Interactions with Utility Structures, Miami, Sept. 1992.

Earle, R A & Lawson, A B 1988. *An Annotated Check List of the Birds of the Golden Gate Highlands National Park*. Koedoe 31: 227-243.

Norton, P M, Lawson, A B, Henley, S R & Avery, G 1986. *Prey of leopards in four mountain areas of the south-western Cape Province*. S Afr J Wildl Res 16: 47-52.

Norton, P M & Lawson, A B 1985. *Radio tracking of leopards and caracals in the Stellenbosch area, Cape Province*. S Afr J Wildl Res 15: 17-24.

Lawson, A B 1982. *Notes on the mammals of the Gamka Mountain Reserve, Cape Province*. Bontebok 2: 1-8.

CERTIFICATION:

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe me, my qualifications and my experience.

_____ Date: _____

Signature of staff member and authorised representative of the firm

Day / Month / Year

Full name of staff member: **ALLAN BRETT LAWSON**

Full name of authorised representative: _____

ANNEXURE B: DRAFT SOCIAL AND ENVIRONMENTAL MANAGEMENT PLAN

ANNEXURE C1: FOCUS GROUP INVITATION

NINHAM SHAND
CONSULTING SERVICES

30 January 2008 Our Ref: 402239/8.124

Dear Sir/Madam

SOCIAL & ENVIRONMENTAL IMPACT ASSESSMENT (SEIA) FOR RöSSING URANIUM MINE'S EXPANSION PROJECT: BULK SULPHUR STORAGE AND HANDLING AT WALVIS BAY PORT
INVITATION TO FOCUS GROUP MEETING

The draft Social and Environmental Impact Assessment Report for Phase 1 of Rössing Uranium's expansion project is currently available for public review and comment until 15 February 2008, at the public libraries in Swakopmund, Walvis Bay and Windhoek, and can also be accessed on the Rossing website, http://www.rossing.com/.

While undertaking the assessment for the acid plant and related sulphur handling during the Phase 1 SEIA process, it was necessary to exclude from the assessment the activities related to sulphur handling in the Port of Walvis Bay. This was due to Rössing identifying alternative sites for sulphur storage in the Port that may be more beneficial than the area originally under consideration and managed by Grindrod Limited, the operators of the bulk handling terminal.

Rössing have now identified three additional locations for sulphur storage that they are considering. As stated in the Phase 1 draft SEIA Report, it is necessary to now initiate another assessment for the EIA process of these alternatives. Grindrod will continue with the assessment for a similar facility within their lease in the Port of Walvis Bay and Alexandra Speiser Environmental Consultants are presently undertaking the required EIA process. Rössing's assessment of an alternative location for sulphur handling will be a parallel process to Grindrod's, since these represent different locations and different proponents. It is not the intention to develop two sulphur handling facilities in the port and the plan is for a single facility that meets the requirements of all stakeholders.

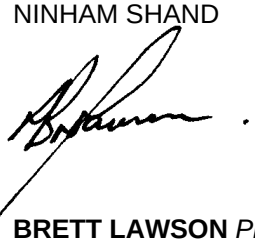
As a key Interested & Affected Party in this particular aspect of the expansion project, we would like to invite you to participate at a Focus Group Meeting which will be held in Walvis Bay on 7 February 2008, at 17h30. The objective of the meeting is to discuss the different alternatives, and any issues, associated with the storage and handling of bulk sulphur at Walvis Bay.

An agenda and a Project Information Document will be sent to you shortly.

We hope you will be able to accept this invitation, and look forward to your participation. Should you have any questions, please do not hesitate to contact Marie Hoadley, the Public Participation Manager for the SEIA, at any of the following contact points:

Email: mariehoadley@iafrica.com
Post: Private Bag 5005, Swakopmund, Namibia
Fax: 064 520 2286

Yours sincerely
NINHAM SHAND



BRETT LAWSON *PrSciNat, EAPSA [Cert]*
Project Manager

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

ANNEXURE C2: COVER LETTER FOR PUBLIC INFORMATION DOCUMENT

NINHAM SHAND
CONSULTING SERVICES

30 January 2008 Our Ref: 402239/8.125

Dear Sir/Madam

SOCIAL & ENVIRONMENTAL IMPACT ASSESSMENT (SEIA) FOR RöSSING URANIUM MINE'S EXPANSION PROJECT: BULK SULPHUR STORAGE AND HANDLING AT WALVIS BAY PORT
PUBLIC INFORMATION DOCUMENT

The draft Social and Environmental Impact Assessment Report for Phase 1 of Rössing Uranium's expansion project is currently available for public review at the public libraries in Swakopmund, Walvis Bay, Arandis and Windhoek, and can also be accessed on the Rossing website, http://www.rossing.com/.

While undertaking the assessment for the acid plant and related sulphur handling during the Phase 1 SEIA process, it was necessary to exclude from the assessment the activities related to sulphur handling in the Port of Walvis Bay. This was due to Rössing identifying alternative sites for sulphur storage in the Port that may be more beneficial than the area originally under consideration and managed by Grindrod, the operators of the bulk handling terminal.

Rössing have now identified three additional locations for sulphur storage that they are considering. As stated in the Phase 1 draft SEIA Report, it is necessary to now initiate another assessment for the EIA process of these alternatives. Grindrod will continue with the assessment for a similar facility within their lease in the Port of Walvis Bay and Alexandra Speiser Environmental Consultants are presently undertaking the required EIA process. Rössing's assessment of an alternative location for sulphur handling will be a parallel process to Grindrod's, since these represent different locations and different proponents. It is not the intention to develop two sulphur handling facilities in the port and the plan is for a single facility that meets the requirements of all stakeholders. Accordingly we are sending you herewith the Project Information Document for this particular aspect of the expansion project.

Should you have any questions or would like to comment in any way, please do not hesitate to contact Marie Hoadley, the Public Participation Manager for the SEIA, at any of the following contact points:

Email: mariehoadley@iafrica.com
Post: Private Bag 5005, Swakopmund, Namibia
Fax: 064 520 2286

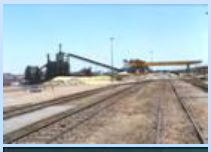
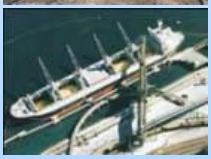
Yours sincerely
NINHAM SHAND

BRETT LAWSON *PrSciNat, EAPSA [Cert]*
Project Manager

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

ANNEXURE C3: PUBLIC INFORMATION DOCUMENT

PROPOSED EXPANSION PROJECT FOR RÖSSING URANIUM MINE IN NAMIBIA



PUBLIC INFORMATION DOCUMENT

SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT

SULPHUR HANDLING FACILITY IN THE PORT OF WALVIS BAY

February 2008

THE PURPOSE OF THIS DOCUMENT

The purpose of this Public Information Document is to brief interested and affected parties and stakeholders about a Social and Environmental Impact Assessment being carried out for a proposed sulphur handling facility in the Port of Walvis Bay.

Besides supplying information about the proposed sulphur handling facility, this Public Information Document also provides an opportunity for people to register themselves as interested and affected parties in the public participation process and to submit any initial comments they may have. Such comments will ensure that all the issues of relevance to the proposed development are evaluated in the Social and Environmental Impact Assessment.

BACKGROUND TO THE PROPOSED SULPHUR HANDLING FACILITY

Rössing Uranium has embarked on a Social and Environmental Impact Assessment process that addresses the possible expansion of their mining and processing operations. Due to an increase in uranium prices on the international market, Rössing is able to consider the possible financial benefit from such an expansion. The anticipated closure date of the Rössing mine is thus being re-evaluated, not only from an economic perspective but also in terms of social and environmental considerations. Ninham Shand Consulting Services has been appointed by Rössing to undertake the Social and Environmental Impact Assessment process.

The maximum extent of the envisaged expansion would entail the mining of two new pits, with new disposal areas for waste rock, new or expanded processing plants, additional tailings dam capacity, and an increase in staff numbers and facilities. One of the proposed new processing plants is for the production of sulphuric acid for use in the metallurgical process on the mine. Such a plant requires sulphur for the manufacture of the sulphuric acid. This sulphur would need to be imported in bulk via the Port of Walvis Bay and a sulphur handling facility would thus be required in the port.

THE ASSESSMENT PROCESS BEING UNDERTAKEN

While undertaking the assessment of the acid plant and related sulphur handling during the Social and Environmental Impact Assessment process, it was necessary to exclude the activities related to sulphur handling in the port. This was due to Grindrod, the operators of the bulk handling terminal, already having initiated its

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

NINHAM SHAND
CONSULTING SERVICES

own assessment process for such a facility. However, Rössing has identified three additional locations for sulphur storage that it is considering and it is now necessary to initiate another assessment process for these alternatives. Grindrod will continue with the assessment for a similar facility within its lease area in the Port of Walvis Bay and Alexandra Speiser Environmental Consultants are presently undertaking the required process. Rössing's assessment of an alternative location for sulphur handling will be a parallel process to Grindrod's, since these represent different locations and different proponents. It is not the intention to develop two sulphur handling facilities in the port and the plan is for a single facility that meets the requirements of all stakeholders.

It is therefore intended to subject the additional sulphur handling alternatives in the Port of Walvis Bay to a parallel assessment process. Once input from the public has been received, a Social and Environmental Impact Assessment Report for the sulphur handling facility in the port as an individual component of Rössing's expansion project will be compiled. After public review, it will be submitted to the Directorate of Environmental Affairs at the Ministry of Environment and Tourism for its decision-making according to the regulatory requirements for assessment processes.

A DESCRIPTION OF THE PROPOSED SULPHUR HANDLING FACILITY AND POSSIBLE ENVIRONMENTAL CONCERNS

Bulk sulphur would be unloaded from the ship's hold by a Siwertell Continuous Ship Unloader with a rated capacity of 650 metric tonnes per hour. An installed Siwertell collector conveyor extending the length of the berth, parallel to the quayside, would be configured specifically to receive product transferred from the ship unloader. From the quayside collector conveyor sulphur would be conveyed, preferably a pipe conveyor, to a fully enclosed storage building. The pipe conveyor would discharge onto a shuttle conveyor that would extend throughout the length of a linear storage building above the stockpile. The closed storage shed should have a holding capacity of a minimum of 30 000 and a maximum of 40 000 metric tonnes.

The conveyor systems are envisaged to be of a design to have minimum transfer stations in order to achieve a zero spillage system. Stockpile management inside the storage shed would be done by rubber-tyred front-end loader. Sulphur reclaimed from the storage building would be loaded into railcars for transport to the mine. To maintain the required logistics, the railcar loading system should have the capability to load 25 railcars with 42 tonnes of product in two hours or less. The rail loading system in the storage shed that has been selected comprises of a radial conveyor extending from a feed chute at the pivot point to the railcar loading station. As each railcar is indexed into position, the loading conveyor is started and loading of the rail car commences. As the loading proceeds, the operator moves the discharge chute of the conveyor along the length of the railcar until the required loading is completed. Sulphur is to be loaded into specially designed railcars currently being investigated. A design for an indexing system is required for indexing of railcars during loading operation at the loading station in order not to tie up a locomotive during loading operations.

Although sulphur is essentially non-toxic, dust that may be generated in the handling process would be controlled by the use of fine water sprays. The sprays would be installed at transfer points in the materials handling system, such as in conveyor chutes and bins. As a safety precaution, infra-red monitors would be installed in the storage shed to immediately detect the

start of a potential sulphur fire. The fire fighting system that would be implemented would consist of water reticulation lines, hose reels and fog nozzles located at strategic places and used to extinguish a fire in the sulphur handling process and storage. The necessary environmental bunding, wash down and drainage collection systems would be installed throughout the facility.

The illustrations below show a typical Siwertell ship unloader and a covered storage building as envisaged.

The most important social and environmental concerns about the proposed handling of sulphur in the Port of Walvis Bay are related to dust and it being regarded as a dangerous substance. In the past, sulphur spillages resulted in concerns on the part of people in the area. Rössing is proposing a closed system of sulphur handling that will allow it to strive for zero spillage and the application of management procedures where this is not possible. Attention will specifically be given to issues of human health in the Social and Environmental Impact Assessment for the proposed sulphur handling facility. Other areas of specialisation that will be attended to in the assessment are the noise and visual impacts of the proposed facility.

ALTERNATIVES BEING CONSIDERED

In working towards a closed system of sulphur handling, Rössing would employ best practice in the important areas of health, safety and the environment. Conventional practice would be employed where this is believed to be adequate for the purpose.

However, the location of the sulphur storage building and the alignment of the pipe conveyor from the quayside are being subjected to the consideration of alternatives. Of importance in the selection of a preferred alternative is the need to reduce the number of bends in the conveyor alignment from the covered quayside conveyor to the storage building. The preferred pipe conveyor is unable to negotiate tight bends and if a covered conveyor were to be used instead, the risk of spillage at the transfer points would be greater.

As mentioned previously, Grindrod is assessing a site within its lease area and this may yet prove to serve Rössing's purpose as well (**Option A on the illustration overleaf**). Rössing is nevertheless also assessing three other possibilities (**Options B, C and D on the illustration overleaf**).

PUBLIC PARTICIPATION AND THE WAY FORWARD

This Public Information Document is being made available to identified interested and affected parties and stakeholders. A focus group meeting is to be held at 17:30 on 7 February 2008 at the Pelican Bay Hotel in Walvis Bay. The proposed sulphur handling facility is also described in the Phase 2 draft Scoping Report for Rössing's expansion project due for release early in February 2008. **A comment period until 29 February 2008 is being provided and input from I&APs and stakeholders is encouraged**.

Marie Hoadley is the Public Participation Manager for this SEIA and input would be welcomed. She can be contacted as follows: Email: mariehoadley@iafrica.com; Post: Private Bag 5005, Swakopmund, Namibia; Fax: 064 520 2286

A Social and Environmental Impact Assessment Report for the proposed facility will be compiled once the comment period closes. This report will include an evaluation of the alternatives mentioned previously, based also on the specialist studies relating to human health, noise and visual impact that will be available then. The report will outline the relevant legal and policy framework, describe the proposed sulphur handling facility and available alternatives, reflect on the public participation process, describe the assessment methodology applied, assess the significance and possible mitigation of potential impacts, and integrate the recommendations made into a management plan.

The Social and Environmental Impact Assessment Report will finally be submitted to the Directorate of Environmental Affairs for their decision on whether or not Rössing's proposed sulphur handling facility in the Port of Walvis Bay is acceptable from a social and environmental perspective.

ANNEXURE C4: FOCUS GROUP MEETING MINUTES

RÖSSING URANIUM MINE EXPANSION PROJECT

FOCUS GROUP MEETING: WALVIS BAY 7 FEBRUARY 2008

RECORD OF STAKEHOLDER ISSUES AND COMMENTS AS PART OF THE SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT FOR PHASE 2 – BULK STORAGE AND HANDLING OF SULPHUR AT WALVIS BAY HARBOUR.

Issues/ questions/comments	Comment by:	Affiliation	Response
WATER			
What measures will be taken about cleaning out the rail cars and dealing with leakage? Will Rössing use TransNamib rail cars?	André Burger	Private, Walvis Bay Municipality	Rössing will purchase customised railcars and TransNamib will manage the operation of transporting sulphur to site. Rössing intends purchasing side tipping rail cars as they are less likely to leak compared to bottom tipping. There will be washbays to wash out the railcars if required. These will be managed by TransNamib.
What happens to the wash down water and where does Rössing intend placing the treatment plant?	Michelle Yates	ASEC	The footprint for the water treatment plant is not yet defined and it is agreed that it will have to be considered in the detailed design.
NOISE AND DUST			
The local residents are very affected by the noise and dust from the port acitivities, especially with respect to manganese and coal ore dust. Will operations at the sulphur handling occur during daylight hours only or extend to a 24 hour operation?	André Burger	Private, Walvis Bay Municipality	Rössing will maintain a 5,000 to 10,000 tonne stockpile at the mine. This will allow a certain amount of flexibility with respect to the number of rail movements. It is anticipated that rail cars will not travel every day, possibly every second day and these will only be done during normal daylight operation. It can be arranged to suit the needs of local residents. However, the offloading of sulphur from the ships will need to be undertaken over a 24 hour operation given demurrage costs. Offloading should take around 4 days and should occur approximately 20 days a year. If the Swivertell facility is made available to other users, then the number of days could increase. Rössing as yet does not know what noise the Swivertell produces, it has requested this information from the suppliers. With respect to dust, it is aiming for zero dust emissions.
Has Rössing considered the cumulative effects in the port given the number of different operation? Either Namport or individual companies need to consider these effects on the community.	David Uushona	Walvis Bay Municipality	Namport representative – Raymond Visagie provided answer: A baseline noise and dust study was completed two years ago. It found that dust levels were exceeded; however noise was wihin acceptable limites. Namport would consider revisiting this study and undertaking more monitoring.
Option D lies adjacent to the salt works. Are there any contamination issues associated with this arrangement?	Keith Wearne	CETN	Rössing has been in discussions with the operators of the salt works and given our commitment to work towards zero spillage. They are happy with this arrangement. They have even offered to move some of their workshops.
Option D and C are close to the salt works. Where are the cement works and are there any issues with general contamination?	Susan Roux	CETN	The same answer was given as above. Rössing needs to ensure that not only do they not contaminate other materials but it is also important that the sulphur is not contaminated by other material, hence the need for a covered storage facility.

Issues/ questions/comments	Comment by:	Affiliation	Response
Internation health standards highlight that noise issues are not specific only to nightime, that noise nuisance can occur during the day. What is Rössing doing with respect to the noise associated with the rail movements?	Deville Dreyer	Walvis Bay Municipality, Heath Department	Rössing's noise and vibration consultants have this week undertaken a baseline noise monitoring of the port and surrounding residential area. A noise assessment will be part of the social and environmental impact assessment.
BIODIVERSITY			
Is Rössing aware that there is a Ramsar site just 300 m from the proposed storage site? What measures are being considered to prevent dust movement during northerly and southerly winds?	Keith Wearne	CETN	At the moment, the engineering is in the concept design phase and the HAZOP will look at the movement of dust and mitigation. We may use wind curtains on site given that the sulphur will be stored in open stockpiles. This stops the wind and sulphur from moving. We could investigate using wind curtains at the port in the unlikely event of a spillage.
SULPHUR HANDLING			
Whose responsibility is the sulphur after it leaves the port?	Rod Brady	NACOMA	The sulphur will always remain the responsibility of Rössing even if it is being transported by TransNamib, as is the case currently with our acid transport. If there is a sulphur spill it will be Rössing's responsibility to take the emergency acition and clean it up. However, the emergency response would need to be triggered by TransNamib.
Have you looked at alternative loading arrangements if there is a breakdown with the offloading equipment?	?	?	We are not looking at alternatives. We have discussed the issue of critical repairs and parts for the Swivertell with the supplier. They intend providing a local representative in Southern Africa and this hopefully should ensure that emergency repairs and parts are available within a day or so.
How does Rössing intend to remove the left over sulphur in the screw conveyor?	Thomas Wolff	WBS	It is a good point. Rössing will need to discuss with the suppliers of the swivertell the issue of how the hold of the ship is cleaned out. It is known that for grab systems, a front end loader is lowered into the hold to remove the remaining sulphur. This issue needs some further consideration and discussion.
How will the tires of the front end loaders be cleaned and will these loaders move from the storage shed to the outside? There may be issues of contamination.	Michelle Yates	ASEC	The vehicles are likely to be dedicated to the storage shed to prevent any issues of contamination. In the even of cleaning, it will be undertaken in washbays and the water appropriately treated.
HEALTH AND SAFETY			
What firefighting systems will be provided for within the sulphur handling shed?	Raymond Visagie	NAMPORT	Rössing will install similar systems to that used are Richards Bay, namely the provision of infra red cameras linked to an alarm system and automatic sprinklers.
What material will the storage shed be made out of? Aluminum?	Deville Dreyer	Walvis Bay Municipality, Heath Department	The shed will be constructed of a material that is both spark free and corrosion resistant. This will be considered in the engineering design.
Have you considered the issue of train accidents at rail crossings in Walvis Bay? There were quite a few accidents in the last few years.	Deville Dreyer	Walvis Bay Municipality, Heath Department	Given that there will be a change from the more dangerous sulphuric acid to sulphur and the number of rail transports will decrease by a thrid, Rössing believe there is a net benefit in this development.
Have you considered that the required evaculation distances for sulphur fire is 800 m?	Deville Dreyer	Walvis Bay Municipality, Heath Department	Sulphur explosions occur due to confinement. At the mine site the sulphur will not be contained and therefore there is no risk of sulphur explosion. At the port all best practice measures will be applied to prevent explosions.

Issues/ questions/comments	Comment by:	Affiliation	Response
What is the potential for explosion if sulphur dust mixes will other dust in the area, eg caustic soda, manganese etc.	Jakobus Olivier	PMC, Protea Chemicals	There is no danger of mixing, given that Rössing is aiming towards zero spillage design. The facility will be undercover so movement and mixing of sulphur with other surrounding dust material is unlikely. However, it should be noted that for options C and D, transfer points along the conveyor will be required, given their location. This is one of the disadvantage of these locations and Rössing is still considering these limitations.
Will Rössing use special front end loaders to prevent the occurrence of sparks and the risk of explosions?	Deville Dreyer	Walvis Bay Municipality, Heath Department	An asphalt floor will be used which should prevent the metal scoops from sparking.
Have Rössing considered the inclusion of metal in the sulphur feed stock? If so, what will they do to screen out these metal pieces to prevent them from becoming a spark hazard?	Deville Dreyer	Walvis Bay Municipality, Heath Department	A screen or magnetic extractor could be used. This will have to be discussed with the suppliers.

PARTICIPANTS

Andre Burger	Walvis Bay Municipality
Kaspur Shimochki	Walvis Bay Municipality
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Susan Roux	CETN
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ANNEXURE D1: SPECIALIST STUDY: ASSESSMENT OF POTENTIAL HUMAN HEALTH RISKS ASSOCIATED WITH ENVIRONMENTAL EXPOSURE TO ELEMENTAL SULPHUR

INFOTOX (Pty) Ltd

Established 1991

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Document prepared on behalf of Ninham Shand Consulting Services

Assessment of potential human health risks associated with environmental exposure to elemental sulphur

Report No 012-2008 Rev 2.0

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31 March 2008

Copyright Warning and Intellectual Property

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1 Introduction

Rössing Uranium has embarked on a Social and Environmental Impact Assessment process that addresses the possible expansion of their mining and processing operations. Ninham Shand Consulting Services has been appointed by Rössing to undertake the Social and Environmental Impact Assessment process. One of the proposed new processing plants will produce sulphuric acid for use in the metallurgical process at the mine. Sulphur required for the manufacture of sulphuric acid will be imported in bulk via the Port of Walvis Bay and a sulphur handling facility would thus be required in the port. The health risk assessment excludes activities related to sulphur handling in the port, since Grindrod, the operators of the bulk handling terminal, has initiated its own assessment process for such a facility. However, Rössing has identified three additional locations for sulphur storage that it is considering and it is now necessary to initiate parallel assessment processes for these alternatives.

Sulphur dust that may be generated in the handling process would be controlled by the use of fine water sprays, installed at transfer points in the materials handling system, such as in conveyor chutes and bins. As a safety precaution, infra-red monitors would be installed in the storage shed to immediately detect the start of a potential sulphur fire. The fire fighting system that would be implemented would consist of water reticulation lines, hose reels and fog nozzles located at strategic places. The necessary environmental bunding, wash down and drainage collection systems would be installed throughout the facility.

In the past, sulphur spillages resulted in health concerns on the part of people in the area. Rössing is proposing a closed system of sulphur handling that will allow it to strive for zero spillage, and the application of management procedures where this is not possible. The company has also undertaken that attention will specifically be given to issues of human health in the Social and Environmental Impact Assessment for the proposed sulphur handling facility. This report honours part of that undertaking, by presenting an assessment of the potential health effects that might be associated with environmental exposure to sulphur dust, due to the offloading and storage of sulphur at the proposed bulk sulphur storage and handling facility at the Walvis Bay Port.

2 Human toxicity of elemental sulphur

2.1 Essentiality for biological function

Sulphur is one of the most abundant chemical elements on earth. It is a major inorganic element, essential for the entire biological kingdom because of its incorporation into amino acids, proteins, enzymes, vitamins, and other biomolecules. Despite physiologic differences, every human introduces into the environment about 370 litre of urine per year containing 0.5 kg of sulphur, or 1 litre/day of urine containing 1.32 g of sulphur. Sulphur is a major constituent of biochemical molecules present in sites rich in connective tissues, such as cartilage and skin. Sulphur is also part of the important reducing agent, glutathione, and vitamins such as thiamin, biotin, and coenzyme A. However, there is no recommended intake of sulphur, and no deficiency is known except in those severely deficient in protein lacking in sulphur-containing amino acids (reviewed by Komarnisky *et al*., 2003).

2.2 Acute toxicity

Sulphur is known to be of low toxicity, and poses very little, if any, risk to human and animal health (EXTOXNET, 1995). Short-term studies have shown that elemental sulphur is of very low acute oral toxicity and does not irritate the skin. USEPA has placed it in its Toxicity

Category IV, the least toxic category for these effects. Sulphur also is not a skin sensitiser, but it may cause some eye irritation. An individual may be exposed for several hours or days to sulphur dust (at relatively high concentrations) before a sensation of scratchy discomfort in the eyes is developed. This may then progress to burning and tearing, with blurring of vision. In these cases there may be loss of patches of corneal epithelium with no evident abnormality of the deeper layers of the cornea. Recovery is spontaneous and complete within two or three days when exposure is discontinued (Grant, 1986).

The respiratory health effects of elemental sulphur are not well documented. Acute exposure to large amounts of elemental sulphur through inhalation may cause catarrhal inflammation[1] of the nasal mucosa[2], which may lead to hyperplasia[3] with abundant nasal secretions. Trachiobronchitis[4] may occur, with dyspnea[5], persistent cough and expectoration[6] (EXTOXNET, 1995).

2.3 Chronic and subchronic toxicity

Topical (to the skin) applications of sulphur ointments (10 per cent sulphur) were used to treat scabies in children (6 months to 13 years), and adverse effects were not reported in 4 weeks of treatment (Singalavanija et al., 2003). However, skin irritant effects are possible, presumably at high levels of repeated exposure (EXTOXNET, 1995).

Chronic exposure to elemental sulphur at environmental levels is generally recognised as a low risk to adverse health effects. Prolonged inhalation of sulphur dust in the occupational setting may cause irritation of the respiratory tract and may aggravate asthma and some other pulmonary conditions (EXTOXNET, 1995). However, dose-response data, in particular no-observed-adverse-effect levels (NOAELs) or lowest-observed-adverse-effect levels (LOAELS) are not available to derive health risk-based guideline concentrations for screening of health risks.

Exposure to elemental sulphur has not been associated with risks of reproductive[7], teratogenic[8] or oncogenic[9] or carcinogenic[10] effects in human and animals. Sulphur has been shown to be non-mutagenic in microorganisms. No guidelines or standards for chronic or sub-chronic exposure to elemental sulphur have been set by regulatory bodies or public health agencies in the world.

[1] Catarrhal inflammation refers to inflammation of the nose and throat with increased production of mucus.
[2] Nasal mucosa is the mucous membrane lining the nasal cavity.
[3] Hyperplasia is an abnormal increase in the number of cells in an organ or a tissue with consequent enlargement.
[4] Trachiobronchitis refers to inflammation of the air passages between the nose and the lungs, specifically in this case the windpipe or trachea.
[5] Dyspnea describes difficulty in breathing, shortness of breath.
[6] Expectoration means ejection (of phlegm etc.) from chest or lungs by coughing or spitting.
[7] Reproductive effects relate to effects on the male or female reproduction systems.
[8] Teratogenic refers to the ability of a substance to cause malformations of an embryo or a foetus.
[9] Oncogenic refers to the ability of a substance to cause or induce the formation and development of a neoplasm (abnormal new growth of tissue; a tumour).
[10] Carcinogenic refers to the ability of a substance to cause cancer.

2.4 Exposure limits for protection of human health

The only available chemical exposure limit values applicable to acute exposure to sulphur are the Temporary Emergency Exposure Limits (TEELs) developed by the US Department of Energy. A hierarchy of sources is used for developing TEELs. Because they are designed to prevent adverse health effects in humans, existing exposure limits are the preferred source of information for the development of TEELs. However, there are many chemicals for which there is no exposure limit information available. For these chemicals, toxicity parameters which have been experimentally derived, such as lethal dose 50 per cent (LD50) and lethal dose lowest (LDLO), are used to set TEELs from mainly animal toxicology studies after making adjustments to extrapolate experimental results from animals to humans. If there are no exposure limits for a chemical, and toxicity parameters are either absent or represent insufficient information, a default methodology has been developed based on structure activity relationships and other available knowledge. It is important to emphasize that TEELs are considered temporary; they are approximations of potential values and are subject to change whenever new or better information becomes available. When more rigorously derived exposure limits are not available, it is acceptable to use TEELs, with the understanding that considerable uncertainty may be involved, because of limitations in the toxicological data on which the TEEL was based (US DOE 2007).

It is recommended that, for application of TEELs, the concentration at the receptor point of interest be calculated as the **peak 15-minute time-weighted average concentration**. The following TEELs were developed for sulphur in air (US DOE, 2007):

- A TEEL-0 of 0.125 mg/m^3, defined as the threshold concentration below which most people will not experience adverse health effects;
- TEEL-1 of 0.4 mg/m^3, defined as the maximum concentration in air below which it is believed nearly all individuals could be exposed without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor;
- TEEL-2 of 2.5 mg/m^3, defined as the maximum concentration in air below which it is believed nearly all individuals could be exposed without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action, and
- TEEL-3 of 12.5 mg/m^3, defined as the maximum concentration in air below which it is believed nearly all individuals could be exposed without experiencing or developing life-threatening health effects.

3 Toxicity to ecological receptors

Sulphur is a non-systemic contact and protectant fungicide with secondary acaricidal (kills mites) activity. It is used for control of brown rot, mildew and powdery mildew, mites, etc. in fruits and vegetables. In studies on ecological effects involving two fish species, daphnia, and mysid shrimp, sulphur has been shown to be practically non-toxic to the aquatic species tested. Sulphur is also considered non-toxic to birds (EXTOXNET, 1995).

4 Conclusions and recommendations

- Sulphur is an essential element for the entire biological kingdom. Sulphur is used to control fungi and mites on fruits and vegetables, but is practically non-toxic to birds and aquatic animal species. Very little else is known of the effect of sulphur on animals. It is

unlikely that concentrations within the recommended human health risk-based air limits will be a threat to plants, animals or aquatic organisms in the vicinity.

- There is no recommended human intake of sulphur to maintain optimum health. Acute and chronic oral exposure to elemental sulphur is known to be of low toxicity. It is assumed that human health-risk based air concentration limits will also restrict the accumulation of sulphur in house dust, provided that normal household cleaning practices are in place. Hand-to-mouth transfer of sulphur in house dust is therefore not considered a threat to the health of infants and small children, if sulphur concentrations in air are within the recommended air limits.

- Sulphur appears to be tolerated well by the skin. However, skin irritant effects are possible in the occupational setting, presumably at high levels of repeated exposure. Prolonged inhalation of sulphur dust, as experienced in scenarios of occupational exposure, may cause irritation of the respiratory tract and may aggravate asthma and some other pulmonary conditions. Air concentration limits that are considered safe for human health should therefore be protective against skin effects due to accumulation of sulphur in house dust, provided that normal household cleaning practices are in place.

- Chronic exposure to elemental sulphur at environmental levels is generally recognised as a low risk to adverse health effects. Exposure to elemental sulphur has not been associated with human or animal risks of reproductive, teratogenic, carcinogenic or oncogenic nature and sulphur is non-mutagenic in microorganisms.

- Guidelines or standards for chronic or sub-chronic environmental exposure to elemental sulphur have not been set by regulatory bodies or public health agencies in South Africa or internationally.

- Concentration limits in air for acute exposure (peak 15-minute time-weighted average (TWA) concentrations) were developed by the US Department of Energy. These are the TEELs discussed in Section 2.4. Peak 15-minute TWA sulphur concentrations of 0.4 mg/m^3 in areas frequented by the general public, including residential areas, are not expected to cause more than mild transient adverse health effects and may be treated as an acceptable upper limit concentration with a 15-minute averaging time. However, as a precautionary measure to ensure the maximum protection of the public against even mild and transient health effects, concerted efforts should be made to limit sulphur concentrations in air to below 0.125 mg/m^3 at all times.

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ANNEXURE D2: SPECIALIST STUDY: ENVIRONMENTAL NOISE REPORT

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Environmental Noise Report

Preliminary – 3 for client use only

Proposed New Sulphur Offloading and Transfer Terminal at Walvis Bay Port for Rössing Uranium Mine

Final report issued on 25/02/2009

John R. Hassall

CONTENTS

EXECUTIVE SUMMARY

A new sulphur offloading and transfer operation is proposed at the existing sulphuric acid tank farm and rail tanker loading site at the Walvis Bay Port to transfer sulphur from ship to rail wagons via a closed storage shed, for transport to Rössing Uranium Mine. This area already has the generally high ambient noise levels typical of an industrial environment. The investigation's purpose was to estimate any potential noise impact of the proposed plant on the existing ambient noise climate in the surrounding residential area. This was achieved by measuring the existing ambient noise levels at two representative positions around the site boundaries.

Two noise measurement positions on the boundary of the port and residential areas, at the closest the proposed infrastructure and operations will come to them, were chosen to determine how the development could impact on possible affected parties. All measurements were carried out in accordance with the relevant SANS Codes of practice, and as required by the regulations of the SA DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM.

The expected response from the local community to the noise impact, i.e. any increase of predicted operational noise over the original ambient noise, is primarily based on the relevant SANS document, and expressed in terms of the effects of impact, on a scale of 'NONE' to 'VERY HIGH'. This report is an overall assessment designed to predict the collective response of a noise-exposed population and therefore the impact the operation is likely to have on them, and is based on measured and predicted equivalent continuous noise levels according to the relevant SANS code of practice.

In the worst case, with no mitigating measures, and using the exposure limits for suburban districts, the daytime impact will be NONE at the port boundaries and the night-time impact NONE to VERY LOW, assuming 24-hour operation of the facility.

The proposed activities are generally similar in function and position to other activities currently taking place on the site. It is expected that the level and character of the noise sources introduced by the proposed operation will also be similar and therefore not differentiate themselves significantly from the existing salt storage activities, either in terms of the types of noise or times of occurrence.

In addition, the total tonnage transferred to Rössing will be smaller, thus reducing the accumulated transport noise impact and most of the stockpiling operation will move from the open to the interior of the closed shed, which will result in significant noise attenuation.

1. PURPOSE OF THE INVESTIGATION AND TERMS OF REFERENCE

A new sulphur offloading and transfer operation is proposed at the existing sulphuric acid tank farm and rail tanker loading site at the Walvis Bay Port to transfer sulphur from ship to rail wagons via a closed storage shed, for transport to Rössing Uranium Mine. This area already has the generally high ambient noise levels typical of an industrial environment. The investigation's purpose was to estimate any potential noise impact of the proposed plant on the existing ambient noise climate in the surrounding residential area. This was achieved by measuring the existing ambient noise levels at two representative positions around the site boundaries.

1.1. Construction phase

Construction activities associated with the new infrastructure are similar to the subsequent activities and therefore unlikely to increase the noise level by more than that experienced for the operational phase. Any construction activity is in any case likely to span a very short time period.

1.2. Operational phase

The assessment of this phase is the primary purpose of this report. The proposed activities are generally similar in function and position within the site to current activities. These include locomotive maintenance in the SW corner of the site between the two noise measurement positions, truck access from 5th Road near measurement position 2, and shunting operations over most of the site, all of which will remain. It is expected that the noise sources introduced by the proposed operation will be similar in characteristics, level, and times of occurrence to the existing activities, and therefore likely to fit in with the existing situation.

1.3. Decommissioning and closure phase

No significant noise impacts are expected during the decommissioning phase of the site. This impact is in any case likely to be of a short duration.

1.4. Possible residual and latent impacts

No residual or latent impacts expected.

2. INVESTIGATIVE METHODOLOGY

2.1. Introduction

A new sulphur offloading and transfer operation is proposed close to the existing sulphuric acid tank farm and rail tanker loading site at the Walvis Bay Port. This has the generally high ambient noise levels typical of an industrial environment. The investigation's purpose was to estimate any potential noise impact of the proposed transfer operations on the existing ambient noise climate in the surrounding area. This was achieved by measuring the existing ambient noise levels at two positions at the boundary of the site with the residential area.

Two noise measurement positions on the port boundaries at the closest the proposed plant will come to the surrounding residential area were chosen as representative to determine how the development could impact on possible affected parties. All measurements were carried out in accordance with the relevant SANS Codes of practice, and as required by the regulations of the DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM.

The expected response from the local community to the noise impact, i.e. any increase of predicted operational noise over the original ambient noise, is primarily based on the relevant SANS document, and expressed in terms of the effects of impact, on a scale of 'NONE' to 'VERY HIGH'. This report is an overall assessment designed to predict the collective response of a noise-exposed population and therefore the impact the operation is likely to have on them, and is based on measured and predicted equivalent continuous noise levels according to the relevant SANS code of practice.

2.2 Ambient noise measurements at the proposed site

The existing ambient noise levels were measured over sampling periods of ten minutes at representative times during the morning, afternoon and evening. Two measurement positions on the site boundaries were chosen as representative of the area and its current and future activities.

At both measurement positions, notes were made on the nature of the contributions to the ambient noise and identifiable noise events where applicable. Measurements were made of the equivalent continuous A-weighted sound pressure level, $L_{Aeq,I}$ using the 'I' (Impulse) dynamic response characteristic as recommended in SANS 10103:2008 (ref. 1), and specified in the South African National Noise Regulations (ref. 5) and

compatible with international practice. In addition, the $\mathbf{L_{90}}$ was recorded, representing the background noise. These procedures are also normal international practice.

2.3 Noise from similar operations

The approach used in this assessment was to utilize measurement data from a similar offloading system from the port of Kwinana in Australia supplied by the manufacturer, and from data readily available for the other noise sources from earlier measurements of similar situations made at an opencast colliery in the Mpumalanga coalfield in South Africa.

2.4. Prediction of noise levels at the proposed site

The supplied noise values from section 2.3. above then formed the basis of calculations to predict the noise levels at specific locations of interest outside the boundaries of the proposed site. Using the point source and attenuation-by-distance model, the following assumptions were made:

1) Acoustically hard ground conditions. This assumes that no attenuation due to absorption at the ground surface takes place. The effects of frequency-dependent atmospheric absorption were also ignored. Both assumptions represent a somewhat pessimistic evaluation of the potential noise impact.
2) Meteorological conditions. Neutral weather conditions, i.e. windless and inversionless, and standard conditions of temperature and humidity (20°C and 50%RH) were assumed, representing a neutral evaluation of the noise impact.
3) Noise measurements were representative of normal operation. Equivalent continuous A-weighted noise levels, $L_{Aeq,I}$, supplied by the manufacturer are assumed to correctly represent the noise from the operation. Impossible-to-predict (random) single noise events not to do with the process and louder than the continuous noise level are not taken into account, although short events which are part of the process, such as the impact noise from loading and material transport and the reversing beepers of FELs, for example, are fully represented in the measurements, representing a neutral to mildly optimistic evaluation of the noise impact.
4) Ambient noise levels. Measured levels were assumed typical of the environment, representing a neutral evaluation of the noise impact.

5) Screening effect of temporary stockpiles, buildings and other barriers. The effect of these temporary structures on the noise climate has been ignored, representing a mildly pessimistic evaluation of the potential noise impact.
6) Current noise control technology is assumed. No allowance is made in the noise level predictions for improvements in noise control techniques which may be incorporated into the proposed project, representing a pessimistic evaluation of the potential noise impact.
7) Worst case operational noise level assumption. The highest noise level of plant was used as the criterion value for the noise predictions at the proposed project, representing a pessimistic evaluation of the potential noise impact.
8) Worst case operational assumption. The assumption has been made that plant is located at the closest possible position it can be to the assessment point, and is continuously in operation, representing a pessimistic evaluation of the potential noise impact.

2.5. Quantifying the noise impact

The noise impact is quantified as the predicted increase in ambient noise level, in decibels, which can be attributed to the operation of the proposed sulphur transfer operation appropriate to the proposed operating times and days.

Existing noise sources include:

- Local community and domestic noise
- Vehicles and other transport serving the existing port and the local community.
- Current operations on the port site, including rail movements and the management of external salt stockpiles using wheeled Front End Loaders (FELs)

Noise level dB(A)	Source	Subjective description
160-170	Turbo-jet engine	Unbearable
130	Pneumatic chipping and riveting (operator's position)	Unbearable
120	Large diesel power generator	Unbearable
110	Circular saw Blaring radio	Very noisy
90 - 100	Vehicle on highway	Very noisy
80 - 90	Corner of a busy street Voice - shouting	Noisy
70	Voice - conversational level	Quiet

Noise level dB(A)	Source	Subjective description
40 - 50	Average home - suburban areas	Quiet
30	Average home - rural areas Voice - soft whisper	Quiet
0	Threshold of normal hearing	Very quiet

Table 1: Typical noise level and human perception of common noise sources

Type of district	Equivalent continuous rating level ($L_{Req.T}$) for noise dB(A)					
	Outdoors			Indoors, with open windows		
	Day-night $L_{R,dn}$ [1)]	Day-time $L_{Req,d}$ [2)]	Night-time $L_{Req,n}$ [2)]	Day-night $L_{R,dn}$ [1)]	Day-time $L_{Req,d}$ [2)]	Night-time $L_{Req,n}$ [2)]
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with one or more of the following: workshops; business premises; and main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

Table 2: Acceptable rating levels for noise in districts (Ref.1)

NB: Day-time : 06:00 to 22:00, Night-time : 22:00 to 06:00

2.6. Assessing the noise impact

The expected response from the local community to the noise impact, i.e. the increase of noise over the original ambient, is primarily based on Table 5 of SANS 10103 (ref. 1), but expressed in terms of the effects of impact, on a scale of 'none' to 'very high'.

INCREASE dB	RESPONSE INTENSITY	REMARKS	NOISE IMPACT
0	None	Change not discernible to a person	None
3	None to little	Change just discernible	Very low
3 ≤ 5	Little	Change easily discernible	Low
5 ≤ 7	Little	Sporadic complaints	Moderate
7	Little	Defined by National Noise Regulations as being 'disturbing'	Moderate
7 ≤ 10	Little to medium	Sporadic complaints	High
10 ≤ 15	Medium	Change of 10dB perceived as 'twice as loud' leading to widespread complaints	Very high
15 ≤ 20	Strong	Threats of community/group action	Very high

Table 3: Response intensity and noise impact for various increases over the ambient noise

3. AMBIENT NOISE MEASUREMENTS AT THE PROPOSED SITE

3.1. Introduction

Noise measurements were carried out at the above site to assess likely response to noise from the proposed transfer terminal. Ambient noise measurements were made in the residential areas at two locations on the property boundary with the port, to define current noise levels at the site.

3.2. Equipment used:

01dB Type SdB01+ Precision Integrating Sound Level Meter, serial number 10180, fitted with 01dB Microphone Type MCE210, serial number 11474, and windscreen. Field calibration using and 01dB Type CAL01 Sound Level Calibrator, serial number 990640.

3.3. Calibration certificates:

All equipment with valid calibration certificates from the De Beer testing laboratories. The calibration certificates are available for viewing if required.

3.4. Procedures used:

Measurements were carried out in accordance with SOUTH AFRICAN STANDARD - Code of practice, SANS 10103:2008, *The measurement and rating of environmental noise with respect to annoyance and to speech communication*, and as required by the regulations of the DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM. NO. R. 154. *Noise Control Regulations in Terms of Section 25 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989)*. Govt. Gaz. No. 13717, 10 January 1992. These are in line with good international practice.

3.5. Ambient noise measurements at the proposed site:

Measurements were carried out at two locations on the property boundary as described below. These locations were chosen for the following reasons:

1) Useful for comparison purposes after development of the site.
2) Most likely to continue to exist after developments on the site.
3) Easily identifiable and with easy access in case of need for future measurements.

Note 1: SANS 10103:2008 defines: Day-time – 06:00 to 22:00

Night-time – 22:00 to 06:00

Note 2: As the proposed plant is planned to operate during any time of the day, assessments have been made for both daytime and night-time periods.

Note 3: All noise levels in this report are A-weighted noise levels expressed in dB(A) re 20 microPascals, and measured according to SANS 10103:2008 (Ref. 1)

Note 4: In the Comments column of the noise tables, C - Car, Minibus or LDV, HGV – Heavy Goods Vehicle or Bus, A/c – Commercial airliner, La/c – light aircraft, c – noise level calculated from traffic count, for the measurement period (usually 10 Minutes)

Aerial view of the area with shed options and measuring positions marked

Location 1

At a point at the port boundary fence 30m north of the centreline of 5th Street West and 220m from the nearest point of the shed B, as shown in the photos below. GPS Coordinates – S 22° 57.538', E 14° 29.647', altitude 11±6m

View to the main port and proposed site

View east along fence 5th Street West

Measurement Table

Date	Time	T °C	RH %	Wind m/s	$L_{Aeq,I}$	L_{90}	Comments
Fri 01/02/08	09:42-09:52	26	66	<5	57.1	48	Shunting in rail yards
Fri 01/02/08	09:53-10:03	26	66	<5	49.4	44	
Sun 03/02/08	13:05-13:15	27	60	<5	49.6	42	C=3
Sun 03/02/08	13:17-13:27	27	60	<5	48.4	41	C=2
Sun 03/02/08	13:29-13:41	27	60	<5	49.2	42	C=2
Fri 01/02/08	14:30-14:33	26	66	<5	51.4	43	
Tues 01/02/08	18:46-18:58			<5	50.2	43	C=1
Tues 01/02/08	18:59-19:09			<5	48.9	43	C=3

Observations: These values are typical of a suburban area, near a road which dominates the noise climate. These values are in very close agreement with the recommended daytime limit for a suburban area of 50 dB(A). This noise level predominates although there are short periods of significantly higher noise levels due to, for example, shunting operations, loading/offloading activities and management of the current open-air salt stockpile positioned near the proposed site using wheeled front end loaders and bulldozers. Similar operations for the sulphur transfer terminal in the current proposal will be moved inside a closed storage shed. Note also that the L_{90} (the sound level exceeded for 90% of the time, and usually taken as the background noise without intruding events) is very stable at 41-43 dB(A) during the day.

Location 2

At a point by the current access point as shown in the photographs below, 80m from the centreline of 5th Road and 180m from the nearest point of the proposed shed A1 near the truck access road to this section of the port. GPS Coordinates – S 22° 57.534', E 14° 29.361', altitude 10.9±5m

View into the proposed site. Truck entrance to left

View to 5th Road and the residential area

Measurement Table

Date	Time	T °C	RH %	Wind m/s	$L_{Aeq,I}$	L_{90}	Comments
Fri 01/02/08	10:15-10:25	26	66	<5	69.2	50	HGV=6 entering the port
Fri 01/02/08	13:00-13:10	26	66	<5	70.1	51	HGV=5 entering the port
Sun 03/02/08	13:45-13:55	27	60	<4.2	51.8	42	
Sun 03/02/08	13:57-14:15	27	60	<4.2	52.2	44	
Sun 03/02/08	13:57-14:15	27	60	<4.2	49.7	42	
Tues 01/02/08	19:15-19:26			<5	52.1	39	C=23 on 5th Road
Tues 01/02/08	19:27-19:37			<5	46.3	39	C=23 on 5th Road

Observations: These values are typical of a suburban area, near 5th Road which dominates the $L_{Aeq,I}$ value. The noise level here is generally the same as at position 1, demonstrating that the noise levels throughout the residential area are uniform. There are periods of significantly higher noise levels due to trucks accessing the port, see the results from Friday 1 February, and other activities in the port mentioned above. Note also that the L_{90} (the sound level exceeded for 90% of the time, and usually taken as the background noise without intruding events) is also very stable at 39-44 dB(A) during the day.

3.6. Noise from similar procedures & equipment

The following noise sources are expected to be present:

1. The Siwertell ship unloader – this is a new source.
2. The shuttle trucks transferring the material from the ship unloading point into the covered storage shed - this is a new source. Noise levels gathered from similar situations is used in the assessment.
3. Management of the stockpiles and loading of the rail loading conveyors within the covered storage shed by wheeled FELs - this is a new source. Measurements of similar loading operations are utilized in this assessment.
4. Loading of the rail cars by conveyer - this is a new source. Measurements of similar loading operations are utilized in this assessment.
5. Rail transport – This is somewhat lower than but similar to existing practice and extent at the port.

3.6.1. The Siwertell ship unloader

File photo of a Siwertell ship unloader similar to that proposed for the terminal

Measurements from a similar unit supplied by the manufacturer and currently utilised in the port of Kwinana in Australia are used in the assessment. See Reference 7. Far-field measurements at this facility determined a noise level at 150m of 59 dB(A). This gives 47 dB(A) at the nearest residential area, approximately 600m from the assumed location at the portside.

The following data was taken from measurements of similar operations at an opencast mine in the Mpumalanga Highveld coalfield of South Africa.

3.6.2. The shuttle trucks

A total of a maximum of 10 return journeys per hour is envisaged to service a 250 mt/h ship unloader. This gives rise to an equivalent noise level, $\mathbf{L_{Aeq,I}}$, calculated according to the relevant SANS document , (ref 2) of 59 dB(A) at 15m. This value has been used in the assessment. This gives a noise level of 34 dB(A) at the nearest residential area at approximately 250m from the nearest possible position of the truck route

3.6.3. The loading operation:

In-shed truck loading operations typical of the proposed terminal

Measurements were made for 3 operations cycles at a distance of 25m from the assumed acoustic center of the operation, over a full loading cycle. The following relevant measurements were recorded.

Meas. Nr.	L_{AeqI}
1	75.0
2	75.1
3	76.7
Average	**75.6**

For calculation and prediction purposes the maximum measurement cycle value of 76.7 dB(A) at 25m (81.1 dB(A) at 15m) has therefore been used in this assessment. It should be noted that this operation will be carried out within a covered storage shed and a conservative allowance of 15 dB is made for the sound attenuation of this structure. The calculated immediate external noise level is therefore 66 dB(A) at 15m. At the nearest residential area, at approximately 250m from the nearest boundary of the storage shed, the noise level is calculated to be 41 dB(A).

3.6.4. The railcar loading system

Measurements made for a similar conveyor system gave values of 62.5 dB(A) at 20m. A value of 65 dB(A)at the standard distance of 15m is used in this assessment. As these operations take place inside the covered storage, a sound attenuation value of 15 dB has been applied, giving a noise level of 50 dB(A) just outside the structure. This is too low to be significant compared to the unloader and the transfer and loading operations and has therefore not been considered as a significant parameter in this assessment.

3.6.5. Rail operations

The lower volume of rail activity, which is predicted to be 3 trains per week between the port and RUL caused by the change from acid to sulphur transport will lead to a small reduction in noise at the port and along the transport route. Under certain conditions, shunting may generate impacts in the couplings which can lead to significant noise wave of noise along the train, especially with empty wagons. This can be reduced or eliminated if it does occur by the use of active brake vans or damped couplings.

4. IMPACT ASSESSMENT

4.1. General

The proposal is for the development of a sulphur ship offloading and railcar loading operation.

A worst case scenario is considered, i.e. that all the operations are the primary noise source in the port area, that they are positioned at the closest possible position to the assessment point under consideration, that there is direct line of sight to the noise sources, that there is a continuous cycle of noise from such sources, and that the emitted noise is the maximum level measured over a representative period from that equipment.

4.2. Continuous equivalent noise levels and individual noise events

This report is an overall assessment designed to predict the collective response of a noise-exposed population and therefore the impact the operation is likely to have on them, and is based on measured and predicted equivalent continuous noise levels according to SANS 10103. It will be possible to detect and distinguish individual noise events, even if the noise impact is assessed as NONE, or VERY LOW, i.e. where a person with normal hearing will not be able to detect the predicted increase in ambient noise level attributable to the proposed facility, but where an individual operation may nevertheless be audible to that person at some time.

4.3. Existing ambient noise levels at the site

The above ambient $L_{Aeq,I}$ and background noise measurements agree well with the values recommended as the highest acceptable for suburban districts according to the relevant section (Table 2 above) of SANS 10103:2008 (see Ref. 1) as follows:

Type of District	Daytime	Night-time
Suburban	50	40

In view of the very consistent existing noise measurements obtained from around the port boundaries, which are in close agreement with the recommended values, (50 dB(A) during daytime (06:00 to 22:00) and 40 dB(A) during night-time (22:00 to 06:00), these recommended values were used in the assessments which follow. This is

standard practice when measured and recommended noise levels are so similar, allowing uniformity in the assessment process.

4.4. Predicted impact of general site operation noise

The various operations are predicted to be well within the daytime noise criterion, and only marginally above the night-time criterion. They are also predicted to be not significantly different from the current noise climate, which is mixed industrial noise, including railway activities, on-site truck movements, materials handling, loading and unloading, industrial and commercial machinery, and local traffic noise on the public access roads.

In the worst case, as described above, with no mitigating measures, and using the limit levels in 4.3. above, the daytime impact will be NONE at the port boundaries and the night-time impact NONE to VERY LOW, assuming provision for 24-hour operation of the facility will be necessary.

4.5. Noise management and mitigation options

Mitigation measures:

1. Maintenance of equipment and operational procedures: Proper design and maintenance of silencers on diesel-powered equipment, systematic maintenance of all forms of equipment, training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events.
2. Placement of material stockpiles: Where possible material stockpiles should be placed so as to protect the boundaries from noise from individual operations and especially from haul roads, which for greatest effect should be placed directly behind them, and be of such a height as to effectively act as a noise barrier, if line of sight calculations show this to be practicable. In particular, the erection of suitable earth berms around fixed plant such as compressors can significantly reduce the noise by up to 15dB.
3. Equipment noise audits: Standardised noise measurements should be carried out on individual equipment at the delivery to site to construct a reference data-base and regular checks carried out to ensure that equipment is not deteriorating and to detect increases which could lead to increase in the noise impact over time and increased complaints.

4. Environmental noise monitoring: Should be carried out at regularly to detect deviations from predicted noise levels and enable corrective measures to be taken where warranted.

Noise management and mitigation options

Phase	Impact: Noise						
	Nature	Extent	Duration	Intensity	Probability	Significance	
						WM	WOM
Construction	Noise	Site local	Short term	Low Negative	Probable	None	V Low
Operation	Noise	Site local	Long term	Low Negative	Probable	None	V Low
Decommissioning	Noise	Site local	Short term	Low Negative	Possible	None	V Low
Residual	None	n/a	n/a	n/a	n/a	n/a	n/a
Latent	None	n/a	n/a	n/a	n/a	n/a	n/a

Table 5. Summary of noise impacts at the port boundaries

WM=With mitigation, WOM=Without mitigation

5. REFERENCES:

1. SOUTH AFRICAN NATIONAL STANDARD - Code of practice, SANS 10103:2008, *The measurement and rating of environ-mental noise with respect to land use, health, annoyance and to speech communication.*
2. SOUTH AFRICAN STANDARD - Code of practice, SABS 10210:2008, *Calculating and predicting road traffic noise.*
3. SOUTH AFRICAN STANDARD - Code of practice, SABS 10328:2008, *Methods for environmental nose impact assessments.*
4. SOUTH AFRICAN STANDARD - Code of practice, SABS 10357: 2008, *The calculation of sound propagation by the Concawe method.*
5. SOUTH AFRICAN DEPARTMENT OF ENVIRONMENTAL AFFAIRS. NO. R. 154. *Noise Control Regulations in Terms of Section 25 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989).* Govt. Gazette. No. 13717, 10 January 1992.
6. Fuggle, R. F. and Rabie, M. A. et al., *Environmental Management in South Africa.* Juta & Co, Ltd., 1992
7. Engineering Dynamics Consultants Pty Ltd, *Noise Measurement of the Siwetell Unloader Nr. 3 at the Bulk Cargo Jetty, Kwinana,* Report 367-01, May 2001

ANNEXURE D3: SPECIALIST STUDY: VISUAL IMPACT ASSESSMENT

Source: http://en.wikipedia.org/wiki/Image:45156420.DSC_2356.jpg

VISUAL STATEMENT

PROPOSED SULPHUR HANDLING FACILITY
WALVIS BAY PORT
NAMIBIA

February 2008

Document prepared on behalf of
Ninham Shand Consulting Services

vrm AFRICA

1 INTRODUCTION

The manner in which the built environment is developed has an immense impact on the intrinsic and systemic value of that environment. Thus developmental integrity is determined by the level of sensitivity practiced in integrating development into the environment in which it is to be located.

The U.K Institute of Environmental Management and Assessment's (IEMA) recommend that: "the ideal strategy for each identifiable negative effect is one of avoidance. If this is not possible, alternative strategies of reduction, remediation and compensation may be explored. If the consideration of mitigatory measures is left to the later stages of scheme design, this can result in increased mitigation costs, because early opportunities for avoidance of negative visual effects are missed." [1] The point of departure of this document is to inform policy makers of the potential visual consequences of the proposed development in an attempt to avoid negative visual impact.

1.1 TERMS OF REFERENCE

The intention of this report is:

- To identify the visual resources of the area which define the landscape character;
- To identify the main potential receptors;
- To identify possible visual triggers pertaining to the proposed landscape modification which would require further study into the visual impact.

1.2 PLANNING POLICY RESEARCH

1.2.1 NAMIBIA'S ENVIRONMENTAL MANAGEMENT ACT (EMA)

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

- by establishing general principles for the management of the environment and natural resources;
- to promote the co-ordinated and integrated management of the environment;

1.2.2 RIO TINTO ENVIRONMENTAL AND SUSTAINABILITY POLICIES

- Wherever possible to prevent, or otherwise minimise, mitigate and remediate, harmful effects of the Group's operations on the environment. *(Rio Tinto Environmental Policy)*
- Excellence in environmental performance is essential to our business success. Compliance with all environmental laws and regulations is the foundation on which we build our environmental performance. *(Rio Tinto Environmental Policy)*

2 BACKGROUND INFORMATION

2.1 LOCALITY

Walvis Bay is situated on the south west coast of Africa at the edge of the Namib Desert and is Namibia's principal port and growth centre. Walvis Bay has about 50 000 citizens and most people are employed at the modern harbour terminal, in the booming fish industry and the processing of sea salt. *(www.namport.com)* Strategically located with direct access to principal shipping routes, Walvis Bay is a natural gateway for international trade with good road and rail connections with the rest of Namibia, Botswana and Gauteng province in South Africa *(www.ports.co.za)*

[1] Guidelines for Landscape and Visual Impact Assessment. 2002. U.K Institute of Environmental Management and Assessment (IEMA). Spon Press. Pg 44

The Walvis Bay Lagoon is regarded as the most important wetland for coastal birds in Southern Africa. A bird count during 1998 found it to be a safe haven for between 70 000 -120 000 birds and a feeding station for about 200 000 birds on their natural migration route to and from the Arctic. *(www.sa-venues.com/regions/attractionsna/namib-region)*

Figure 1: Google Earth Aerial Photograph Map of Walvis Bay

2.2 PROJECT DESCRIPTION

The site is situated in the bulk handling terminal of the Walvis Bay Port**.** Rössing Uranium Ltd (RUL) is undertaking a Social and Environmental Impact Assessment for a proposed sulphur handling facility in the Port of Walvis Bay. The proposed bulk sulphur would be unloaded from the ship's hold by a Continuous Ship Unloader and conveyer system, design to have minimum transfer stations in order to achieve a zero spillage system. The sulphur would be unloaded to a quayside collector conveyor then conveyed, preferably a pipe conveyor, to a fully enclosed storage building. The closed storage shed should have a holding capacity of a minimum of 30 000

and a maximum of 40 000 metric tonnes and an approximate size of 40m x 100m x 20m high. Stockpile management inside the storage shed would be done by rubber-tyred front-end loaders. Sulphur reclaimed from the storage building would be loaded into railcars for transport to the mine.[2]

Figure 2: The illustrations above show a typical Siwertell ship unloader and a covered storage building as envisaged.
Source: Ninham Shand Sulphur handling PID final. February 2008

Figure 3: Layout Alternatives *Source: Ninham Shand Sulphur handling PID final. February 2008*

The current private operators of the bulk handling terminal are assessing a site within their lease area for a sulphur handling station. (Option A in Figure 3 above). However, Rössing has identified three additional locations for sulphur storage and it is now necessary to initiate a further assessment process for these alternatives. (Options B, C and D in Figure 3 above).[3] Of these alternatives this document will only be assessing Option B, the Preferred Development Option. Option B is situated directly across the old rail line to the SE of the two large Protea Chemicals Division sheds covering an area of approximately 12,000m².

[2] Ninham Shand Sulphur handling PID final. February 2008
[3] Ninham Shand Sulphur handling PID final. February 2008

3 RESULTS

3.1 SITE LANDSCAPE CHARACTER

Namport, the National Port Authority in Namibia since 1994, manages the Port of Walvis Bay which is Namibia's largest commercial port, receiving approximately 1,000 vessel calls each year and handling about 2.5 million tonnes of cargo. Continuous efforts are in place to upgrade existing infrastructure. (*www.namport.com*) The foreground view from residential Walvis Bay is one of garrets, cranes and other infrastructure related to the harbour.

Figure 4: Port of Walvis Bay *Source: http://en.wikipedia.org/wiki/Image:45156420.DSC_2356.jpg*

A Visual Resource Management methodology involves comparing the proposed features with the major features in the existing landscape using the basic design elements of form, line, colour, and texture. Based on this analysis, potential triggers are assessed and recommendations are defined to avoid, reduce or mitigate the proposed landscape modifications so that the visual impact does not detract from the surrounding landscape sense of place. The table below is a preliminary summary of the design elements of the existing landscape character of the harbour as seen from the highly exposed receptors surrounding the area. Also incorporated in the table is an assessment of the Visual Absorption Capacity (VAC) defined by the Western Cape Department of Environmental Affairs and Development Planning [4] as the potential of the landscape to conceal the proposed project, usually based on topography, vegetation cover or urban fabric in the area;

ELEMENT	*VAC*	*COMMENT*
FORM	HIGH	The form element is dominated by the large, horizontal and rectangular shapes of the warehouses and factories. Due to the size and scale, these shapes create high levels of contrast which attract the attention of the casual observer.
LINE	HIGH	The line element is created by the vertical lines of the cranes, the ships and the sides and roof features of the warehouses which create strong levels of contrast.

[4] Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning (DEA&DP), Cape Town.

COLOUR	HIGH	The light white colours of many of the warehouses are very reflective and create high levels of contrast.
TEXTURE	MODERATE	The material used to cover some of the warehouse is reflective and creates moderate levels of contrast. The materials of the warehouses which are rough in texture and dark grey in colour reduce the level of contrast in the existing visual element.

The high levels of contrast created by the warehouses, cranes and ships create high levels of contrast within the immediate area surrounding the harbour. Areas further away from the harbour have medium VAC levels as the height of the cranes and warehouses protrude above the average level of the residential houses located in the surrounding areas. It is important to note that the views from the lagoon are visually significant and as such should be protected from large structures dominating the landscape as seen from this location.

3.2 POTENTIAL RECEPTORS

A site visit was undertaken and photographs taken from residential receptors located in close proximity to the proposed storage site. Figure 5 (below) depicts the view as seen from a road in the residential suburb to the east of the site. Figure 6 below depicts the view from the lagoon area towards the harbour. The landscape character of the harbour as seen from this location is flat and horizontal with some vertical lines created by the cranes. As a result of the birdlife in the lagoon, this area is a significant tourist destination and needs to be protected from structures which protrude above the existing low horizontal form of the Walvis Bay.

Figure 5: View of harbour structures and facilities from residential area adjacent the harbour site.

Figure 6: View from lagoon area of Walvis Bay toward the harbour.

During the site visit it was determined that although the receptors would have high levels of visual exposure to the proposed site, the significance of the visual impact would be low due to the existing harbour infrastructure surrounding the site which creates a high Visual Absorption Capacity (VAC). Should the proposed structure be of a similar scale, form, colour and line to the surrounding warehouse type structures, the level of visual impact would be low and no further investigation into visual impact would need to take place.

4 VISUAL TRIGGERS

The Western Cape DEA&DP *Guideline for involving Visual and Aesthetic Specialists in EIA Processes*[5] highlights potential triggers which indicate whether visibility and aesthetics are likely to be 'key issues'. The following triggers are applicable to this project:

The nature of the receiving environment:	***Trigger:***	***Comment:***
Areas with protection status, such as national parks or nature reserves;	No	The harbour is an industrial site that does not include any national parks or nature reserves.
Areas with proclaimed heritage sites or scenic routes;	Yes	The harbour is not a proclaimed landscape heritage site. The probability does exist that tourist ocean cruises could be offered from the harbour area and as such the area would form part of a scenic route.
Areas with intact wilderness qualities, or pristine ecosystems;	No	The industrial nature of the site does not include any areas with intact wilderness qualities or pristine ecosystems.
Areas with intact or outstanding rural or townscape qualities;	No	The harbour and town do not have outstanding rural or townscape qualities.
Areas with a recognised special character or sense of place;	Yes	The lagoon area is visually significant; however visibility of the proposed structure is limited from this location. The harbour does have a special sense of place but it is industrial in nature. The significance of the site comes from the relation to the sea views and the ships in the harbour. The proposed structure would not detract from the sense of place.
Areas lying outside a defined urban edge line;	N/A	
Areas with sites of cultural or religious significance;	N/A	
Areas of important tourism or recreation value;	No	The harbour might have some tourist related activities operating from the area but these would be specifically related to harbour view and as such the high levels of contrast created by the harbour would be acceptable.
Areas with important vistas or scenic corridors;	No	As above.

[5] Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town.

The nature of the project: *(Guideline for involving Visual and Aesthetic Specialists in EIA Processes. Pg 10)*		
High intensity type projects including large-scale infrastructure;	Yes	The proposed structure would be classified as a large-scale structure.
A change in land use from the prevailing use;	No	The proposed structure would be of a similar design and constructed of similar materials to the existing storage structures that are located adjacent to the site.
A use that is in conflict with an adopted plan or vision for the area;	No	All the proposed sites are located within the harbour area.
A significant change to the fabric and character of the area;	No	The area is already an established harbour with a strong industrial sense of place. The proposed structure will not significantly alter the fabric and character of the area.
A significant change to the townscape or streetscape;	No	As above
Possible visual intrusion in the landscape	No	If the proposed structure is of a similar size and scale to the existing bulk storage facilities adjacent the site, the visual intrusion would be limited.
Obstruction of views of others in the area.	No	The proposed structure will not obstruct any significant views from sensitive receptors.

Potential Accumulative Impacts:		
A significant change to the fabric and character of the area	No	The proposed structure would not result in further accumulative visual impacts from further development or visual degradation to the area.

5 CONCLUSION

A site visit was undertaken and photographs taken from residential receptors located in close proximity to the proposed storage site. A preliminary study into the landscape character of the area was undertaken. It was determined that although the key receptors would have high levels of visual exposure to the proposed landscape modification, the significance of the visual impact would be low due to high levels of existing contrast created by the harbour infrastructure surrounding the site which increase the visual absorption capacity. Should the proposed structure be of a similar scale, form and line to the existing, adjacent warehouse type structures, the level of visual impact would be low. In this regard, it is our recommendation that no further investigation into visual impact would need to take place.

6 RECOMMENDATIONS AND SUGGESTIONS

- It is recommended that light coloured paints and reflective building materials should not be used. Darker grey colours and rougher textured materials would created less contrast to the surrounding areas and reduce the level of visual impact. The proposed structure should be of a similar size and scale to the existing warehouse structures adjacent the site.
- It is suggested that to reduce the impact of the heavily industrial nature of the proposed structure as seen from the close receptors, that the existing avenue of palm trees is continued around the edge of the harbour boundary.
- It is also suggested, if at all possible, that the structure is positioned as close as possible to the existing structures to the west so that they read as a single unit. This would reduce the protrusion effect of the structure as seen from close residential receptors.

7 VRM AFRICA DETAILS

This document was completed by Silver Solutions 887 cc trading as VRM Africa, a Visual Impact Study and Mapping organisation located in George, Western Cape. We make use of the well-documented visual impact analysis methodology developed by the Bureau of Land Management in the USA in order to accurately and objectively quantify visual impact. This methodology involves the sequential mapping of visual resources of the site in relation to the surrounding areas. For this purpose we make extensive use of GIS and 3D modelling technology. Over the last 5 years VRM Africa has completed over 60 Visual Impact Studies throughout South Africa and Namibia. The majority have been based in the Western Cape ensuring we have extensive practical experience assessing projects in terms of the planning policies stipulated by the DEA&DP Guidelines and the Western Cape PSDF.

Authors

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REPORT NUMBER: 4873/105551

DATE: 06 November 2009

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