



SUSTAINABILITY ASSESSMENT

for the
Life Extension of Rössing Uranium Mine

INTEGRATED EXECUTIVE SUMMARY



A summary of the main document.
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In association with **Golder Associates Africa**.



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Rössing Uranium Limited is planning to extend the life of Rössing Mine beyond a possible early closure date before 2010 until 2016. This extension requires an Environmental Impact Assessment to be carried out under the Namibian Environmental Assessment Policy. The results of the assessment study carried out during 2003 is summarised in this Integrated Executive Summary.

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1. Introduction

Over the years, some concerns have been raised regarding the exploitation of Namibia's uranium resources by a foreign company and the potential impacts Rössing Uranium Mine has on worker health and the natural environment.

However, it is also recognised that the mine, together with the Rössing Foundation, has made a highly positive contribution to the socio-economic development of the Erongo Region and Namibia as a whole. Consequently, this study was conducted to determine whether the positive influences of the mine outweigh the potential negative impacts - thus guiding a decision on whether to extend mining operations through to 2016 or opt for closure in 2007.

This study is based on the requirements of Namibia's Environmental Assessment Policy - a policy which advocates the objective assessment of potential environmental, social and economic impacts of an envisaged project. Assessments of this nature are used as a tool to help developers and the authorities make important implementation decisions. From the perspective of sustainable development (which aims to improve and sustain the quality of life of current and future generations) the different alternatives for the mine's future - extension or closure - will have significantly different impacts.



Figure 1. Map of the Namib Desert showing the location of Rössing mine about 65 km north east of Swakopmund.



Figure 2. An aerial photo showing the tailings dam, open pit and processing plant of Rössing Mine

Thus, for this assessment, Rössing Uranium Limited, in consultation with the external reviewer (the Southern African Institute for Environmental Assessment) decided to undertake a full Sustainability Assessment (SA) of the mine - rather than being limited to an Environmental Impact Assessment (EIA). The key difference between the two is that an SA considers a wide range of site-specific issues as well as impacts in the broader context, while an EIA in this case, would focus more narrowly on aspects such as tailings management, water use and pit extension. It should be noted that a number of detailed, sector specific EIAs have been conducted over the past fifteen years and the mine consequently has a very comprehensive Environmental Management Plan and monitoring system in place.

The Sustainability Assessment that is summarised in this document takes cognisance of past studies and existing systems, and investigates ways of creating lasting sustainable economic and other benefits to Namibian society during the remainder of the mine's life and long after its closure.



2. Aims of the Sustainability Assessment



An aerial view of Rössing's tailings disposal site.

The main aims of the Sustainability Assessment were to:

- ◆ Identify whether there are any aspects (“fatal flaws”) that could prevent the mine extension from going ahead at all.
- ◆ Identify the attitudes and concerns of all stakeholders (Interested and Affected Parties) – including current Rössing employees, affected local communities, government, the mine’s business partners and the general public - regarding the mine’s future. These opinions played an important role in guiding the Sustainability Assessment.
- ◆ Compare the likely environmental and socio-economic risks and benefits of extending the life of the Rössing mine to 2016 with those of early closure in 2007. Questions to be answered are concerned with the sustainability of these options and investigate which alternative will provide the more lasting benefits and contribute most to improving the quality of life of Namibians - both now and in the future.
- ◆ Suggest recommendations on how to minimise the potential negative impacts and enhance the positive impacts of the mine. These recommendations are to be used as a foundation for the management plans that will be implemented either for the extension or closure of the mine.

A key focus of this study was the development of a measure for sustainability. This was needed to help quantify and compare the anticipated long term benefits of the mine life alternatives and to allow an assessment of whether mine extension to 2016 will facilitate value to future generations.

These measures also allow for the important quantification and evaluation of positive and negative impacts of the expansion alternative – the “net impact” - from the sustainable development perspective.

3. Approach to the study

The approaches used in this Sustainability Assessment were guided by Namibia's Environmental Assessment Policy and the global *Mining, Minerals and Sustainable Development (MMSD)* project¹.

This project highlights the need for specific actions should the mining industry want to become more proactive in contributing to sustainable development in the region. Successful implementation of MMSDs recommended actions would lead to outcomes important for the Southern African region including poverty alleviation, job creation, capacity building and skills development, good governance and gender equity.

Specific recommendations in the MMSD report address the establishment of HIV/AIDS programmes, information sharing with affected parties, community consultation, social impact assessment, detailed research on environmental management options, reduction of seepage impacts on water, sustainable post closure land use and periodic reporting of sustainability performance.



Visitors to the Open House Days.

Ensuring Public and Stakeholder Involvement

In order to encourage public participation several open house meetings were held at the beginning of the study. These were co-ordinated by the company *ProImage* in collaboration with Rössing staff and aimed at providing a high quality, non-threatening opportunity for people from all sectors of society to obtain up to date information and express their opinions on the future of the mine and the issues that needed to be addressed in the study.



Students at the Open House Days held at Arandis to inform the public about the mine's activities.

Following standard EIA methodology, the study was taken to the "scoping level" through the consultation process. Scoping is defined as the process of identifying the environmental issues to be investigated in a study. The purpose was to focus specialist investigations on those issues that are expected to be significantly affected by the mine extension option.

¹ The MMSD Project formed part of the Global Mining Initiative (GMI) project, a worldwide initiative by key role players in the mining sector to develop a model for sustainable development for the mining industry, and to identify ways in which the sector's social and environmental performance could be improved. The Rio Tinto Group, which is the majority shareholder of Rössing Uranium, played a key role and as a catalyst in both the GMI and the establishment of the International Council on Mining and Metals (ICMM), which was established in 2002 to provide global leadership on sustainable development in the mining sector.

Investigating the Potential Impacts of Mine Extension vs. Early Closure

The following potential environmental risks of extending the mine to 2016 were identified and investigated:-

- i. The effects of increases in radiation levels on human health (to workers, Arandis residents and the public in nearby communities).
- ii. The use/wastage of limited fresh water supplies and other natural resources.
- iii. Increased volumes of seepage water from the tailings dam and the impacts on desert biodiversity and groundwater protection.

The following socio-economic benefits and risks of extending the mine to 2016 as apposed to early closure in 2007 were identified and investigated:

- iv. The effects on the Namibian economy, poverty alleviation and job creation.
- v. The impacts on the economic sustainability of the Arandis community.



An aerial view of the Rössing open pit.

The Study Team

The study was conducted by a team of mine personnel, various Rio Tinto and external specialists in the different fields of research. The investigations of this team were carried out in parallel and interactively with the engineering and financial feasibility studies conducted for the extension proposal. This was done to update the engineering teams on issues to consider during plant design and the environmental teams to evaluate impacts of more detailed engineering designs, as they became available. As mentioned above, stakeholders were given the opportunity to help identify risks and opportunities throughout the study period. Regular feedback on study progress and outcomes was provided to those Interested and Affected Parties, local and regional government and the study steering committee.

The Review Process

In order to give full credibility to the study, it was subjected to independent professional review throughout the process. A Steering Committee² was formed to help determine the scope of the study, review interim findings and sign off on the final outcome of the Sustainability Assessment. The Southern African Institute for Environmental Assessment was appointed to professionally review the technical aspects of the study.



² This Steering Committee is chaired by the Deputy Minister of Works, Transport and Communication, the Hon. Asser Kapere, who is also a councillor for the Arandis constituency in the Erongo Regional Council. Members of the Steering Committee are representatives of the Ministries of Environment and Tourism, Mines and Energy, Health and Social Services, Water, Agriculture and Rural Development, the Desert Research Foundation of Namibia, the Rössing Foundation and Rössing Uranium Ltd.

4. Results

The study has found that there are no “fatal flaws” which will prevent expanding the mine’s life to 2016. Sufficient uranium ore is available to continue mining operations but substantial capital investment will be needed for the replacement of haul trucks and ore shovels and to upgrade equipment in the uranium production plant. Furthermore, fluctuating uranium prices and the value of the N\$ against the US\$ (Rössing’s uranium is sold in US\$) could make Rössing’s operation unfeasible at any time.

The consultation process addressed the concerns of local stakeholders. These concerns are primarily related to the long-term effect of radiation and dust exposure at the mine, the availability and quality of water downstream of the mine, the long-term future of Arandis and the availability of jobs after mine closure for Rössing employees. It was found that most of these concerns stem from a lack of information. The process identified the need for more information to be made available to the public and recommendations have been made in this regard.

Uncertainties in study results were identified through initial review by Rio Tinto specialists and will be addressed in finalising implementation plans. The other specialist studies were able to draw on sufficient available information and provided recommendations to a level of detail, which is sufficient to develop management plans for implementation.

The main findings of the specialist studies and the overall evaluation are summarised in the paragraphs below. A more detailed description of the planned changes to the operation can be found in chapter 2 of the main report and a description of the current influence of the mine on the socio-economic and the natural environment in chapter 6.

Radiation Levels and Human Health Risks

Concerns are continually being raised about radiation levels and their associated health risks at the mine and in Arandis. The assessment has shown that radiation levels will continue to remain well below the international limits set for protection of the public against radiation. However, radiation levels will increase, albeit insignificantly, due to the combined effect of the extended area of the tailings dam, the extended heights of the waste rock disposal areas and the slightly larger open pit volume if the mine life is extended to 2016.

The graph below shows that the radiation dose of the extended mine is only marginally higher than that of the current operation and is situated well below the public dose limit of 1000 microSievert per year.

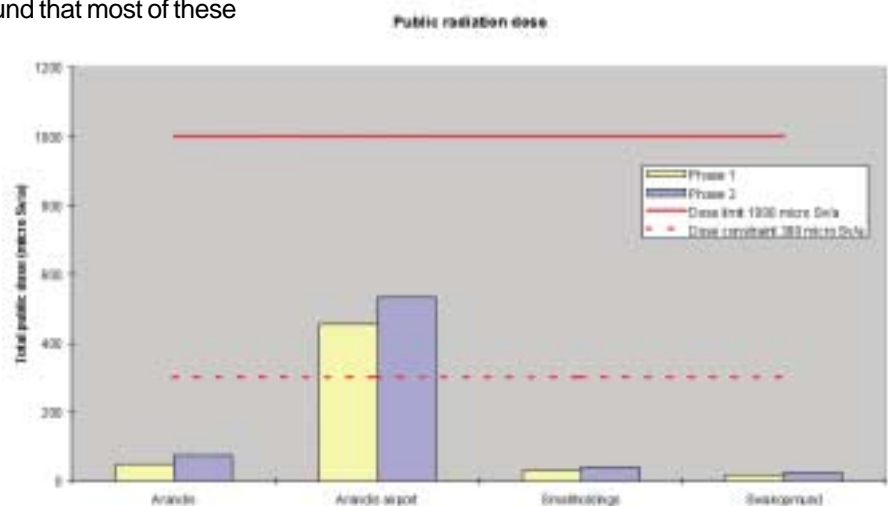


Figure 3. Radiation doses of Phase 1 (current) and Phase 2 (mine extension to 2016).

An occupational risk assessment is currently being conducted at the mine. Consequently occupation health studies were not included in this Sustainability Assessment. Management systems addressing occupational exposure to radiation by mine employees have been in place at the mine since the early 1980's and the environmental management system was recently certified compliant to international environmental management standards (ISO 14001).

Impacts of Extending the Tailings Dam

The highest environmental risks identified during the impact assessment were those associated with the proposed extension of the tailings dam. Figure 4 shows the present tailings dam and the area which would be covered if the mine life is extended to 2016 (indicated as a line to the north of the dam).

An additional area of 300 ha – about half the size of the current disposal area – of undisturbed ground would

be affected by the dam extension. In this event the surrounding environment will be flooded with hazardous mine tailings resulting in the localised destruction of desert habitat and the loss of biodiversity, including rare desert plants.

Crushed and ground rock is deposited on the tailings dam, initially in form of a wet slurry, consisting of equal proportions of fine and coarse sand and water. The tailings become dryer with time as water evaporates or filters downwards. The volume of water and the resulting height of the underground water table inside the sand-slurry mass will have an influence on the stability of the surrounding tailings dam walls.

For the currently existing dam, surface and groundwater seepage is collected by pumping systems surrounding the dam for return into the mine's water recycling system. In this way, the quality of the groundwater of the Khan River is protected from being affected by the mine.

Figure 5 below indicates anticipated seepage rates during phase 2 (extension to 2016) compared to



Figure 4. The current tailings dam and its proposed extension if mining operations continue to 2016.

volumes currently pumped and the total pumping capacity of the current systems. The graph shows that these systems will be able to control the projected seepage rates in future.

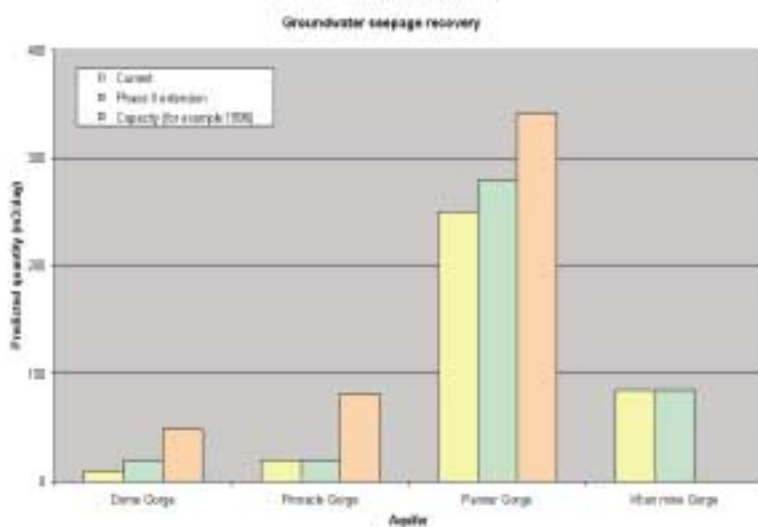


Figure 5. Current groundwater seepage recovery compared to projected phase 2 if the mine is extended to 2016.

The Use of Freshwater and Other Resources

The use and possible wastage of limited fresh water in Namibia's desert environment is always a major concern. Regular consultations with NamWater and bulk water users in the central Namib area are ongoing and will continue with the aim of jointly managing the sparse water resources at the coast. A similar forum will be established with Swakop River water users in the near future. Improved water saving and recycling methods are being proposed.

Currently the Rössing mine is using approximately 30% of the freshwater consumed in the central Namib area. Discussions with Namibia's bulk water supplier NamWater have shown that there are sufficient water reserves available for the mine to continue its operations until 2016 without affecting water availability to other bulk users and without seawater desalination becoming neces-

sary. In the unlikely event of no rainfall and floods occurring in the Omaruru River between now and 2016, the groundwater reserves of the Omaruru Delta (Omdel) groundwater will be reduced. Over the long term however and after mine closure, the Omdel dam would provide river water to refill the aquifer for the continuing bulk water supply to the coastal area.

Figure 6 shows the water demand projection from the Omdel water supply scheme assuming Rössing uses new water-conserving techniques during phase 2 (bars). Long term sustainable water yield with and without additional infiltration basins at the Omdel scheme are indicated (top and middle line respectively), as well as a medium term yield assuming no overflow of the Omdel dam causing no additional water infiltration during the period of phase 2 mining (bottom line). The bars below the top line indicate that water demand will stay below the projected volume of water available for use. The pumping of limited quantities of brackish water from the Khan River near the mine can continue without affecting water availability at the Swakop River farms.

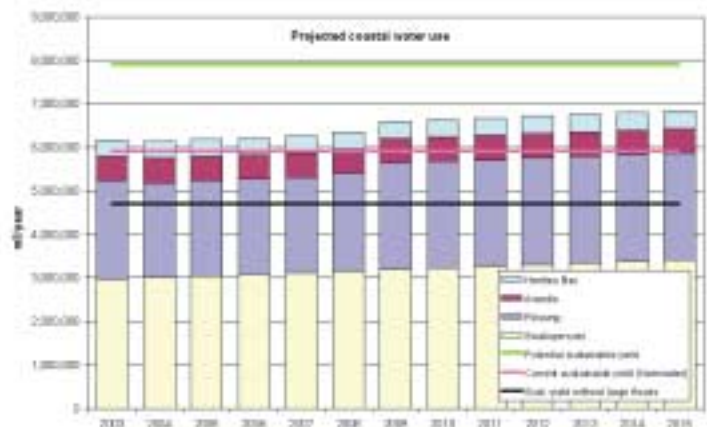


Figure 6. Projected water demand in the Central Namib 2003 - 2015.

The Impacts on the Namibian Economy, Job Creation and Poverty Alleviation

To date Rössing mine has made a substantial contribution to the economy of the Erongo Region and Namibia as a whole. In 2001 the mine contributed N\$ 1 billion to the Namibian economy (2.5% of GDP) and 10% to Namibia's export earnings. Depending on the future value of the US\$, the tax regime and contributions from the other Namibian primary industries, this contribution to the country's economy could increase if mining activities are extended to 2016.

If the mine were to extend its operations to 2016 the total value of uranium production is likely to be more than US\$ 1,000 million, with a proportion of about one half going towards wages, taxes and interest as well as profits distributed to shareholders. Although not included in the calculation of this proportion, payments for supplies to the mine would represent an important indirect contribution to the economic activity in Namibia.

The most significant economic impact of extending the mine to 2016 will be experienced at the local level in the form of job provision. Employment is expected to provide approximately 930 jobs annually for the 12-year period – thus directly and indirectly contributing to the income of almost 1000 households and ultimately helping to support more than 4000 people in the Erongo Region. The total economic contribution, however, will be larger than these estimates and will include the effect of workers spending their wages, the government utilising their tax revenues and shareholders spending their profits.

Furthermore, rural communities benefit from remittances from mine employees and indirect beneficiaries. Given that many households are impacted by AIDS illness and death, including looking after orphans of deceased relatives and friends, this remittance is of particular importance.

With extension to 2016, an additional 10% new workers could find employment at the

mine. In a region where unemployment is over 30%, the availability of about 80 new jobs would play an important role, particularly as a number of these jobs would involve training and skills development.

Furthermore, mine life extension would allow the mine to continue its wellness, safety and environmental training programmes and other initiatives that significantly improve the lives of workers and their families. Rössing employees, for example, have a considerably lower rate of HIV infection than their counterparts in the Erongo Region overall. Mine life extension would allow the mine to consider scaling up these initiatives for the benefit of wider communities in the region.

The Impacts on the Economic Sustainability of the Arandis Community

The social studies have shown that Arandis, although now an independent town, is still almost entirely dependant on the mine. From this point of view early closure of Rössing could be disastrous for the current residents and future of this town. Extending mine life into Phase 2 would provide enough time for the Rössing Foundation to help develop alternative economic activities in Arandis - thus providing an opportunity for it to develop economic impetus and independence from Rössing mine.



A haultruck was donated to the Arandis community to start a mining history museum.



5. Conclusions

In summary, the environmental study concluded that:

- There are no significant negative environmental impacts associated with mine extension to 2016, which cannot be addressed and minimised. In fact, as part of the upgrading of the uranium production process, there are a number of proposed operational changes, which will result in improved environmental performance, including reduced water usage rates, reductions in dust emissions to air and reductions in the potential for groundwater pollution.
- The continued operation of the mine would not deprive future stakeholders and generations of access to essential resources.

The socio-economic study concluded that:

- The mine has a substantial positive impact on the economy of Namibia and specifically on that of the Erongo Region.
- Extending mine life to 2016 would provide more time for Arandis to develop economic independence from the mine and reduce the risk of becoming a ghost town.

The yellow bars in the graph depicted in Figure 7 show that the positive opportunities on the right hand

side outweigh the risks of mine life extension on the left-hand side.

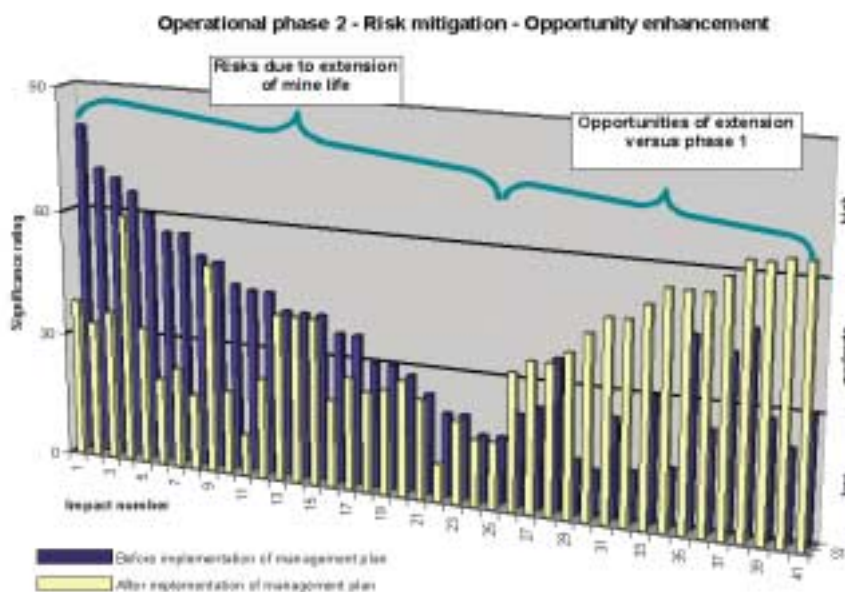


Figure 7. Risk and opportunity significance ratings.

Criteria describing the quality of life of people living in the area of Rössing's influence now and after closure were used as indicators for evaluating and measuring progress towards lasting socio-economic development. Anticipated outcomes from actions planned to be taken during the mine life alternatives were evaluated using the indicators and it was shown that expansion outperforms early closure by far in respect of contributing to lasting socio-economic

development. This is related to the fact that the mine's environmental impacts are less significant compared to its positive influence on the socio-economic conditions of the region.

The bars in the bottom diagram of Figure 8 show schematically that the indicators for quality of life of people (basic needs, security, social needs etc.) are better met by the extension option compared to early closure (which is indicated in the top diagram of Figure 8).

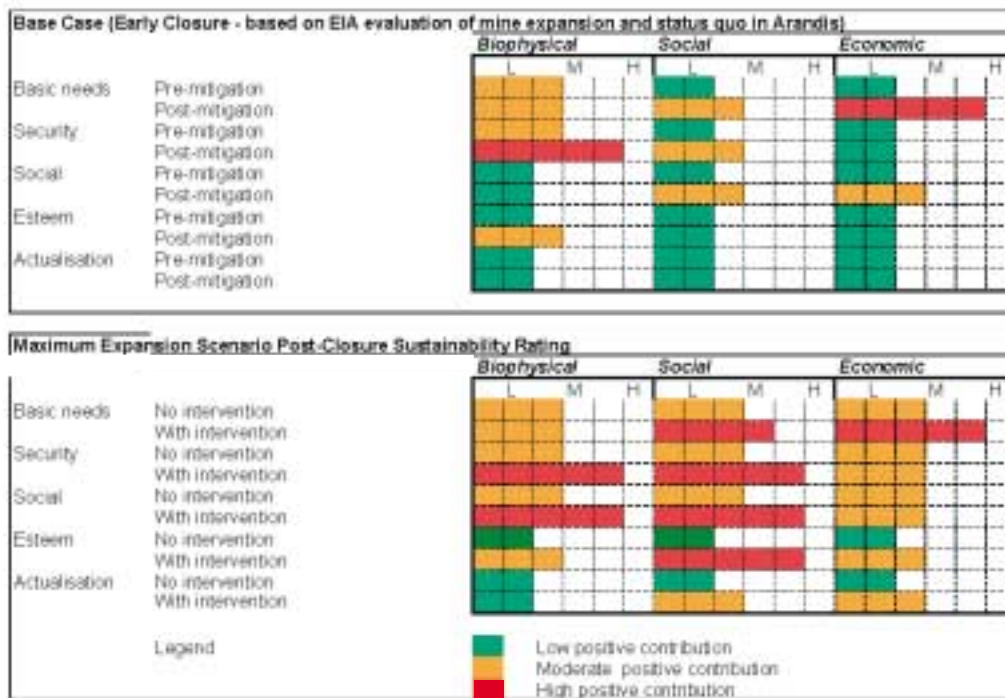


Figure 8. Comparative diagram showing impact on quality of life of Arandis community.

This study concluded that the net impact of the proposed extension of the Rössing mine to 2016 will be positive - particularly with respect to the contribution it will make to the sustainable socio-economic development of the Erongo Region up to and beyond mine closure.

6. Recommendations and the way forward

A number of recommendations were formulated in the Sustainability Assessment and specialist studies. These recommendations will be incorporated into the management plans for mine life extension and closure and will be implemented once the decision about the mine's future has been taken.

Recommendations to be immediately implemented are related to the activities of the Rössing Foundation in Arandis, ongoing stakeholder communication and further development of tailings waste management plans.

Recommendations Regarding Stakeholder Communication

All stakeholders and affected parties must be informed about the mine's future and the impacts resulting from extension to 2016. Rössing's response to concerns raised by the public should be well publicised so that interested and affected parties can, at any time, see how Rössing is managing its environmental impacts and helping to improve the economic sustainability of Arandis.

Recommendations regarding Improvements to the Tailings Waste Management System

Work to conserve water should continue to ensure the most efficient use of the sparse resource. To counteract the impacts of a tailings dam that is 50% larger than the current facility the relocation of rare plants is recommended.

Further research must be conducted to confirm measures necessary to guarantee the stability of the extended tailings dam walls and the management of seepage from the extended tailings facility.

To guarantee that the tailings dam walls do not break under the additional water pressure, thus releasing hazardous sludges into the local environment, specific water drainage systems reducing the height of the groundwater table inside the dam have been recommended (see Figure 9 below). More detailed engineering work and experiments are proposed before the final design of the planned systems can be completed.

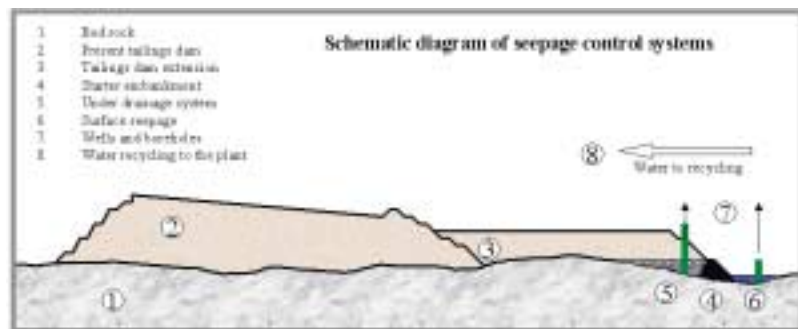


Figure 9. Schematic diagram of seepage control system.

Recommendations Regarding the Socio-Economic Sustainability of Arandis

More detailed studies of current local socio-economic conditions needs to be made.

The Rössing Foundation, in partnership with the local authorities and community of Arandis, should continue to strengthen the town's municipality and council. Projects must be developed to promote the economic independence of the town and provide the basis for economic growth and survival after the closure of the mine. The benefits of mine life extension would be particularly important for skills training of current and future mine employees.

Recommendations for Mine Closure

Closure of the mine after the extension period in 2016 would be managed the same way as it is planned for the case of closure around 2007 and would not create impacts which will reduce the future development options in the area.

The open pit will not be filled back with the large amount of waste rock deposited on the waste rock dumps around the pit due to prohibiting costs. However, the open pit will be made safe so that no falls or rockslides can injure anybody venturing in its vicinity. The tailings dam will be covered with a complete layer of rock preventing wind and rainwater from eroding the tailings material and from blowing or washing it into the environment surrounding the dam. Radiation levels will remain within the current safe levels over the long term. The volume of water still remaining in the tailings dam after closure will be pumped into the open pit for evaporation, so that the Khan River groundwater will continue to be adequately protected. The cost of all planned closure activities in 2016 has been calculated at N\$450 million and provision is made for the money to be available at the end of the extended mine life.

The Way Forward

Detailed work is needed in all areas to develop implementation plans from the recommendations once the decision about the direction of the mine's future has been taken. The recommendation to continue mining phase 2 until 2016 is the major outcome of the study. It is based on the anticipated positive impacts on the socio-economic development of the Erongo Region and Namibia and recommends that the future of Arandis should be taken into consideration during decision-making about the future of the mine.

Although the study is formally completed, it is regarded as a live document informing future planning of the Rössing mine's operations and the activities of the Rössing Foundation. It is intended to inform the major decision by the regulators and Rössing's shareholders about the implementation of Rössing's expansion project. The next

step in the process is for the regulators to decide whether the project can be implemented from the environmental perspective. Should this be the case, the decision whether to extend the life of the mine or not has to be made by the shareholders of the company - of which the government of Namibia is one - according to the economic feasibility of the proposal under the prevailing economic conditions. Rio Tinto's Energy product group, of which Rössing is a member, has developed a sustainable development framework with focus areas to incorporate sustainable develop-



Women haultruck drivers.

ment aspects into the mine's business processes.

The results and recommendations from the Sustainability Assessment will be used to operationalise the framework and to realise its full value by applying it to the local context. A number of recommendations have been formulated in the overall Sustainability Assessment as well as in the specialist studies. These will be incorporated into the management plans for mine life extension or closure and implemented after the decision about the mine's future has been taken.

Recommendations to be immediately implemented are related to the activities of the Rössing Foundation in Arandis, ongoing stakeholder communication and further development of tailings waste management plans.

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