Metago

Environmental Engineers (Pty) Ltd

ENVIRONMENTAL SCOPING REPORT FOR THE PROPOSED ROSSING SOUTH URANIUM MINE

Prepared For

Swakop Uranium (Pty) Ltd

METAGO PROJECT NUMBER: M009-03

REPORT NO. 1

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ENVIRONMENTAL SCOPING REPORT FOR THE PROPOSED ROSSING SOUTH URANIUM MINE

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1. INTRODUCTION

1.1. INTRODUCTION TO THE PROPOSED PROJECT

Swakop Uranium (Pty) Ltd (Swakop Uranium) is a wholly-owned subsidiary of Extract Resources Ltd (Extract), which is an Australian-based uranium exploration and development company. Exploration activities have been undertaken by Extract in Exclusive Prospecting Licence (EPL) 3138, which includes the Rössing South and Ida Dome uranium deposits. The subject of this scoping report and environmental impact assessment (EIA) process is the development of a mine to extract uranium from the Rössing South deposit, which is located approximately 5km south of the existing Rössing Uranium Mine in the northern part of the Namib Naukluft Park. The main deposit comprises Zone 1 and Zone 2 with other zones identified further south, as well. The regional and local settings of the proposed mine are shown in Figures 1-1 and 1-2 respectively.

Swakop Uranium plans to develop a new uranium mine with a design capacity to produce between 4000 and 7000 tonnes of uranium oxide per annum. The operation is planned to comprise a conventional load and haul open pit mining operation, processing plant, mine residue disposal facilities, as well as support infrastructure including road access, power supply, water supply, sulphuric acid manufacture or transport and storage, fuel and lubricant storage, workshops and offices. The proposed new mine and associated infrastructure is hereinafter referred to as "the project".

1.2. PROJECT MOTIVATION (NEED AND DESIRABILITY)

The motivation for the project is economic in nature. The resource estimate for the Rössing South project indicates that the uranium deposit is a significant discovery, and that the proposed project has the potential to be one of the top ten global uranium mines by metal contained in the deposit. The project has the potential to benefit the country, society and the surrounding communities both directly and indirectly. Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the increased spending power of employees through the creation of new jobs at the mine. The challenge facing Swakop Uranium is to contribute these benefits while at the same time preventing and/or mitigating potential negative social and environmental impacts.

1.3. INTRODUCTION TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The Ministry of Mines and Energy (MME) is responsible for issuing mining authorisations, which must be obtained before mining can begin. Before a mining licence can be granted, an environmental impact assessment (EIA) is required to be undertaken by the project proponent and authorised by the Ministry of Environment and Tourism (MET) in terms of the Environmental Management Act, 7 of 2007. Although the proposed EIA regulations have not yet been promulgated in a final form, the draft regulations (April 2009) and Namibian Environmental Policy for EIA (1995) have been used as a guideline where relevant. The EIA comprises two key phases: the scoping phase and the environmental impact assessment (EIA) / environmental management programme (EMP) phase.

This report is the scoping report. The main purpose of this scoping report is to generate terms of reference for the EIA that will enable the meaningful assessment of all relevant environmental and social issues. Within this framework, the required components of the scoping report (as per the draft EIA regulations) are included below, as are references to the relevant sections and appendices:

- curricula vitae of the people responsible for compiling the scoping report (appendix E);
- description of the proposed activity (section 5);
- description of the need and desirability (section 1);
- environmental, geographical, social and cultural description of the property where the project may be located (section 3);
- identification of relevant legislation, policies and guidelines (section 1);
- description of the public participation process (section 2 and 9 and appendices A to D);
- description of alternatives (section 6);
- description and assessment of potential impacts (section 7);
- draft environmental management plan (section 8); and
- terms of reference for the detailed EIA (sections 8 and 9).

FIGURE 1-1: REGIONAL SETTING

FIGURE 1-2: LOCAL SETTING

1.3.1. EIA PROCESS

The EIA process and corresponding activities are outlined in Table 1-1.

TABLE 1-1: EIA PROCESS

Objectives	Corresponding activities
Project initiation/screening phase (June – August 2009)	
• Notify the decision making authority of the proposed project • Initiate the environmental impact assessment process.	• Project initiation meetings and site visit with the Swakop Uranium technical team to discuss the project requirements, identify environmental and social issues and to determine legal requirements. • Meeting with the Ministry of Environment and Tourism (MET): Directorate of Environmental Affairs (DEA). • Written notification submitted to MET (27 July 2009).
Scoping phase (August - November 2009)	
• Identify interested and/or affected parties (IAPs) and involve them in the scoping process through information sharing. • Identify potential environmental issues associated with the proposed project. • Consider alternatives. • Identify any fatal flaws. • Determine the terms of reference for additional assessment work.	• Notify government authorities and IAPs of the project and EIA process (telephone calls, e-mails, faxes, distribution of background information documents, newspaper advertisements and site notices). • Scoping meetings with authorities, and IAPs (11-13 August 2009). • Compilation of scoping report (August 2009). • Distribute scoping report to relevant authorities and IAPs for review (November 2009). • Forward finalised scoping report and IAPs comments to MET for review (February 2010).
EIA/EMP phase (October 2009 to May 2010)	
• Provide a detailed description of the potentially affected environment. • Assessment of potential environmental impacts. • Design requirements and management and mitigation measures. • Receive feedback on application	• Investigations by technical project team and appointed specialists. • Compilation of EIA and EMP reports. • Distribute EIA and EMP reports to authorities and IAPs for review (April 2010). • Forward EIA and EMP reports and IAPs comments to MET for review (May 2010). • Circulate the record of decision for the EIA from MET to all IAPs registered on the public involvement database.

1.3.2. EIA TEAM

Metago Environmental Engineers (Pty) Ltd (Metago) is the independent firm of consultants that has been appointed by Swakop Uranium to undertake the environmental impact assessment and related processes. Joanna Goeller (project manager) has fourteen years of relevant experience. Brandon Stobart (project reviewer) has over ten years of relevant experience and is certified with the Certification Board for Environmental Assessment Practitioners of South Africa (EAPSA) as an Environmental Assessment Practitioner (EAP). The relevant curriculum vitae documentation is attached in Appendix E.

The proposed environmental project team is outlined in Table 1-2.

TABLE 1-2: PROPOSED ENVIRONMENTAL PROJECT TEAM

Team	Name	Designation	Tasks and roles	Company
Swakop Resources Project Team	Andrew Penkethman	Project Manager	Responsible for the interface between Swakop Uranium and the environmental team, and for ensuring implementation of the EIA outcomes.	Extract Resources
	Martin Spivey	Exploration Manager		Extract Resources Swakop Uranium
	Sadike Nepala	General (Country) Manager		Swakop Uranium
	Norman Green	Chief Executive Officer		Swakop Uranium
Project management	Joanna Goeller	Project Manager	Management of the process, team members and other stakeholders. Report compilation.	Metago
	Brandon Stobart	Project Reviewer	Report and process review	
	Natasha Daly	Project Assistant	Project administration, compilation of reports and update of IAP database	
Specialist investigations	Hanlie Liebenberg-Enslin	Air quality	Air quality impact assessment	Airshed Planning Professionals
	Ian Jones	Soils and land capability specialist	Soils and land capability assessment	Earth Science Solutions
	Graham Young	Visual specialist	Visual impact assessment	Newtown Landscape Architects
	John Kinahan	Archaeologist	Heritage resource assessment	Quaternary Research Services
	Gerrie Muller and Eon Reyneke	Social and Economic specialists	Socio-economic impact assessment	Metago Strategy4Good
	Gerhard Liebenberg and Rean Swart	Radiological specialists	Radiological impact assessment	Nuclear Energy Corporation of South Africa
	Alexandra Speiser	Co-ordination	In-country public participation co-ordination, and general input to EIA.	Independent consultant (ASEC cc)
	Auriol Ashby	Public participation specialist	Arrangement and facilitation of public consultation meetings	Independent consultant
	Theo Wassenaar	Biodiversity	Ecological impact assessment	African Wilderness Restoration
	Coleen Mannheimer		Vegetation assessment	NBRI
	Jeff Jolly	Water scientist	Groundwater assessment	Aquaterra
	Gordon McPhail	Engineer	Waste, surface water and closure assessment	Metago

2. SCOPING METHODOLOGY

2.1. INFORMATION COLLECTION

Metago used various sources to identify both the environmental issues associated with the proposed project and the terms of reference for the required investigations.

The main sources of information for the preparation of the scoping report include:

- Husab Uranium Project vegetation study (Coleen Mannheimer)
- Archaeological Reconnaissance Survey of the Husab Uranium Project (John Kinahan);
- Process flow diagram (GRD Minproc);
- Site visits by Metago;
- Consultation with the technical project team;
- Consultation with the team of environmental specialists;
- Consultation with IAPs; and
- Consultation with relevant authorities.

2.2. PUBLIC CONSULTATION PROCESS

By consulting with authorities and IAPs, the range of environmental issues to be considered in the EIA has been given specific context and focus. Included below is a summary of the people consulted, the process that was followed, and the issues that have been identified.

2.2.1. AUTHORITIES AND IAPS

The following authorities and IAPs are involved in the EIA process:

- **National authorities:**
  - Ministry of Environment and Tourism (MET);
    - Directorate of Environmental Affairs
    - Directorate of Parks and Wildlife;
  - National Heritage Council of Namibia;
  - Ministry of Mines and Energy (MME);
  - Ministry of Agriculture, Water and Forestry (MAWF);
    - Department of Water Affairs;
  - Ministry of Health and Social Services (MHSS);
  - Ministry of Labour and Social Welfare; and
  - Ministry of Works, Transport and Communications.
- **IAPs:**
  - surrounding farmers and landowners;
  - tourism operators;

- surrounding mines and industries;
- non-government organisations and associations;
- local authorities (Erongo Regional Council, Swakopmund, Walvis Bay and Arandis Municipalities);
- parastatals such as NamWater and NamPower; and
- any other people/entities that choose to register as IAPs.

The full stakeholder database for the project is included in Appendix B of the report.

2.2.2. STEPS IN THE CONSULTATION PROCESS

Table 2-1 sets out the steps in the consultation process that have been conducted to date:

TABLE 2-1: CONSULTATION PROCESS WITH IAPS AND AUTHORITIES

TASK	DESCRIPTION	DATE
Notification - regulatory authorities and IAPs		
Written notification to MET	A BID regarding the project was sent to MET. A copy of the covering e-mail is attached in Appendix A.	27 July 2009
IAP identification	Stakeholder databases of other uranium projects in the area were used as a starting point to compile a database for the Rössing South project. The database has been updated to include additional IAPs and will be updated during the EIA as required. A copy of the IAP database is attached in Appendix B.	July 2009
Distribution of background information document (BID)	BIDs were distributed via email to all IAPs on the project's public participation database and were available at the scoping meetings. A copy of the BID is attached in Appendix C. The purpose of the BID was to inform IAPs and authorities about the proposed project, the EIA process, possible environmental impacts and means of inputting into the EIA process. Attached to the BID was a registration and response form, which provided IAPs with an opportunity to submit their names, contact details and comments on the project.	July – August 2009
Site notices	Site notices were placed at the Swakopmund Library, the Walvis Bay Library, Arandis Town Hall, the Swakopmund Information Centre, the Swakopmund Town Council, the Ida Camp office and the Ida Camp entrance on the C28. Copies of the site notices and photographs of the places where site notices were displayed are attached in Appendix C.	30 July 2009
Newspaper advertisements	Block advertisements were placed as follows: • The Namibian (31 July, 5 August and 10 August) • The Republikein (28 July) • The Allgemeine Zeitung (28 July and 10 August); and • The New Era (31 July, 4 August and 10 August). Copies of the advertisements are attached in Appendix C.	July - August 2009
Scoping stage meetings and submission of comments		
Scoping meetings	Four scoping meetings were arranged, one in Windhoek, Swakopmund, Arandis and Walvis Bay respectively. The same project information was presented at all three meetings. Minutes of the meetings are attached in Appendix C.	11 – 13 August 2009

TASK	DESCRIPTION	DATE
Review of scoping report		
IAPs and authorities (excluding MET) review of scoping report	Copies of the scoping report will be made available for review at the following places: MET library and Windhoek National library, Walvis Bay public library, Swakopmund public library, Arandis public library and the Swakop Uranium town office in Swakopmund. Electronic copies of the report will be made available on request (on a CD). Summaries of the scoping report will be distributed to all authorities and IAPs that are registered on the project's public involvement database via post and/or e-mail. Authorities and IAPs will be given 30 days to review the scoping report and submit comments in writing to Metago. The closing date for comments is 29 January 2010. This will be explained further in the distribution covering letter.	25 November
MET review of scoping report	A copy of the final scoping report, including authority and IAP review comments, will be forwarded to MET on completion of the public review process.	January 2010

2.2.3. SUMMARY OF ISSUES RAISED

A description of issues that have been raised to date by authorities and IAPs is given in Appendix D to the scoping report. Issues raised pertain to:

- EIA procedural issues;
- technical/project related issues;
- decommissioning and closure;
- water supply;
- power supply;
- soils;
- biodiversity;
- heritage resources;
- groundwater;
- air quality;
- geology;
- radiological aspects;
- noise;
- transport; and
- socio-economic issues.

3. DESCRIPTION OF THE CURRENT ENVIRONMENT

This section has been compiled using information included in existing specialist studies for Swakop Uranium's EPL and from recent site visits undertaken by the project team. These information sources are considered relevant because the project is located within EPL 3138. On receipt of the planned specialist reports for the project, the descriptions of the current environment will be updated.

3.1. GEOLOGY

The proposed project is located within the central Damara Orogenic Belt (DOB), in a zone which is characterised by basement domes, regional folding, faulting and late Proterozoic intrusive rocks. The project area is dominated by a series of north-northeast to north-east trending regional scale antiforms and synforms, which make up the main structural architecture of the Central Zone of the Damara. These meta-sedimentary folds or dome-like structures of the DOB are covered by gneissic and metasedimentary rocks of the Abbabis Formation. The basement rocks are covered by stranded cover sequences of flat-lying calcrete and alluvial deposits, which are associated with a broad north-east trending valley marginal to the Khan River. The majority of the project area is covered by Quaternary cover.

The target zone in the Rössing South area hosts uraniferous leucogranites (alaskites), which trend southwards under cover for a distance of approximately 15km. The mineralised alaskites have predominantly intruded dilational sites within the Rössing Formation, and are most concentrated around zones of folding. The dominant lithologies at Rössing South are calcsilicate and biotite schist, with few occurrences of Rössing Formation marble. Khan formation schist and gneiss are the dominant footwall units.

The majority of the uranium mineralisation at the Rössing South project site is hosted within the alaskite, with some mineralisation in the calcsilicates and biotite schist.

3.2. CLIMATE

3.2.1. REGIONAL CLIMATE

Although the proposed project area is situated in the arid Namib Desert it is approximately 55km from the coast. Given this, the climate is influenced by both the desert and the coast.

3.2.2. RAINFALL AND MOISTURE

Annual rainfall in the relevant region consistently increases with distance from the coast. The Rossing South project site is situated in a belt that receives an average of less than 100mm of rain per annum.

The recorded rainfall data for the site indicates that rainfall events are uncommon with the chance of rain on any given day being calculated at less than 5%. The recorded annual rainfall ranges from less than 5mm to more than 100mm. The wetter months are January, February, March and April. The drier months are June, July and August. In dry periods, the region can experience periods of up to a year without any rainfall. Flash flooding has also been known to occur due to significant rainfall events. The maximum single recorded rainfall event in the region is 45mm (recorded at Rossing in 1995).

In addition, it must be noted that the Rossing South project site is within the coastal fog belt. Fog events provide an important source of moisture to the ecosystem functionality.

3.2.3. TEMPERATURE

The recorded annual average temperate is 24˚C. The typical range is from 5˚C to 45˚C. The variation between summer and winter months is approximately 7˚C for both maximum and minimum temperatures.

3.2.4. WIND

The predominant daytime wind is from the northwest, west and south west. The predominant night time wind is from the southeast. In general, the stronger winds are from the eastern sector and are associated with speeds in excess of 8m/s. During the spring and summer months, strong winds of more than 8m/s dominate from the westerly sector with infrequent winds from the other sectors. During the autumn and winter months, strong winds of more than 8m/s dominate from the easterly sector with some westerly winds still occurring. It is during the winter months that the highest wind speeds are recorded and these are associated with the “east winds”. The highest recorded wind speed in the area is 17.2m/s.

3.2.5. EVAPORATION

Evaporation figures are high, but the values are lower than those observed at desert locations further inland. This is because the Namib desert is not considered a particularly warm desert with maximum temperatures not exceeding 45˚C.

3.3. TOPOGRAPHY

The proposed project area is located in the northern part of the Namib-Naukluft Park, and comprises largely sandy gravel plains, which are crossed by ephemeral watercourses and washes which trend in a north-east to south-west direction (see Figure 1-2). Gravel-gneiss hillocks, dissected by sandy washes, are found in the north and north-west part of the project area. The non-perennial Khan River lies to the north-west and west of the project area in the river canyon.

The Khan mountains are located to the north of the project site, Husab mountain to the south and the Geisebberg to the north-east.

3.4. SOIL

Soils in the project area comprise soils associated with the gravel plains and the basement schists.

3.5. LAND CAPABILITY

Given the climatic and physical aspects described above, the natural land capability is limited to conservation, wilderness and eco-tourism.

3.6. LAND USE

3.6.1. PRE PROJECT LAND USE

The project site is located in the northern part of the Namib-Naukluft Park, and the area is largely undisturbed, except for prospecting activities taking place in the area. Land immediately surrounding the project site is used for conservation, eco-tourism and mining (Rössing uranium mine is located approximately 5km to the west).

3.6.2. SURROUNDING STRUCTURES/SERVITUDES/VILLAGES

This section should be read with reference to Figure 1-2.

There are no communities living in the immediate vicinity of the project area. The closest communities are:

- Arandis – the nearest permanent habitation to the project, is approximately 19km from the centre of the deposit;
- Farmers and local landowners – Hildenhof, the closest farm, is approximately 22km from the centre of the deposit. The nearest farm to the north east is 27km away at Bloemhof.;
- Swakopmund – approximately 55km from the project site; and
- Walvis Bay – approximately 80km from the project area.

There are a number of significant tourist attractions within the Namib Naukluft Park in the same region as the proposed project area. The Great Welwitschia tourist site lies approximately 12km from the centre of the deposit.

There are no formal roads within the project area. Surrounding roads include:

- the gravel C28 through the Namib Naukluft Park that links Swakopmund to Windhoek (approximately 40km to the south west of the project site);

- the B2 tar road between Swakopmund and Windhoek (approximately 13km to the north-west of the site); and
- various unnamed gravel roads.

There are a number of other mining and mineral exploration companies in the region that are engaged in either exploration, construction and/or operational activities. Those closer to Rössing South include:

- Rössing Uranium Limited (operational);
- Langer Heinrich Uranium (operational);
- Reptile Mining (exploration);
- Bannerman Resources (exploration & feasibility phase);
- Areva Resources Namibia/Trekkopje (construction);
- Forsys Metals Corporation/Valencia (mining licence awarded but not yet in construction phase); and
- Nova Energy (exploration).

A number of these mining and exploration operations, namely Langer Heinrich Uranium, Reptile Mining, Bannerman Resources and Nova Energy also operate in the Namib Naukluft Park.

3.7. NATURAL VEGETATION

The project area is situated in the Desert Biome within the Central Namib vegetation zone. This biome has significant vegetation endemism (species restricted to this biome), with over 30% of plants that occur in the Namibian section of the Desert Biome thought to be endemic. In the project area, which is located in the Central Namib, the proportion of endemic plants recorded is approximately 19% of the plant population. Table 3-1 shows the species of conservation importance in the various vegetation zones.

TABLE 3-1: PLANT SPECIES OF CONSERVATION IMPORTANCE LIKELY TO OCCUR IN THE PROJECT AREA

Zone Description	Sub-Division	Species of Conservation Importance*
Sandy-gravel plains	Plains	*Zygophyllum stapfii* (Dollar bush) *Arthraerua leubnitziae* (Pencil bush) *Commiphora saxicola* (Rock Corkwood)
	Drainage lines and washes	*Zygophyllum stapfii* (Dollar bush) *Arthraerua leubnitziae* (Pencil bush) *Commiphora saxicola* (Rock Corkwood) *Adenolobus pechuelii* (Namib's neat foot) *Petalidium pilosibracteolatum*
	Koppies and ridges	*Commiphora saxicola* (Rock Corkwood) ***Aloe asperifolia*** ***Hoodia pedicellata*** *Larryleachia marlothii* ***Commiphora oblanceolata* (Kanniedood)**
Gravelly-gneiss hillocks		*Zygophyllum stapfii* (Dollar bush) *Arthraerua leubnitziae* (Pencil bush)

Zone Description	Sub-Division	Species of Conservation Importance*
		Commiphora saxicola (Rock Corkwood) *Petalidium pilosibracteolatum* ***Aloe asperifolia*** ***Commiphora oblanceolata*** *Sterculia africana* (tick tree) *Adenolobus pechuelii* (Namib's neat foot)
Large valleys and drainage lines		*Zygophyllum stapfii* (Dollar bush) *Arthraerua leubnitziae* (Pencil bush) *Acacia erioloba* (camel thorn) *Petalidium variabile* (variable petalidium)

** Species listed in bold type are considered to be of high conservation importance.*

The Welwitschia plains (*Welwitschia mirabilis)* are located to the south and south east of the project site.

3.8. ANIMAL LIFE

The Rössing South project site is situated in the Desert Biome. This biome has significant insect and reptile endemism (species restricted to this biome). Faunal occurrences within the area are largely determined by the vegetation communities described in section 3.7. Mammal species that are expected to occur in the project area are listed in Table 3-2.

TABLE 3-2: MAMMALS LIKELY TO BE FOUND IN THE PROJECT AREA

Scientific name	Common name
Petromus tpyicus	Dassie rat
Lepus capensis	Cape hare
Procavia capensis	Rock dassie
Oryx gazella	Gemsbok
Antidorcas marsupialis	Springbok
Sylvicapra grimmia	Common duiker
Oreotragus oreotragus	Klipspringer
Equus zebra hartmannae	Hartmann's mountain zebra
Hyaena brunnea	Brown hyaena

Reptile species that are expected to occur in the area are listed in Table 3-3.

TABLE 3-3: REPTILES LIKELY TO OCCUR IN THE PROJECT AREA

Scientific name	Common name
Pedioplanis husabensis	Husab sand lizard
Mabuya hoescih	Hoesch's skink
Rhoptropus bradfieldi	Bradfield's Namib day gecko
Ptenopus species	Barking gecko
Meroles anchietae	Shovel-snouted lizard
Pedioplanis rubens	Waterberg sand lizard

Avifaunal species that have been identified in the surrounding area are listed in Table 3-4.

TABLE 3-4: BIRDS LIKELY TO OCCUR IN THE PROJECT AREA

Scientific name	Common name
Struthio camelus	Ostrich
Falco tinnunculus	Rock kestrel
Eupodotis rueppellii	Rüppel's korhaan
Burhinum xapensis	Dikkop
Cercomela tractrac	Tractrac chat (dark and light variants)
Parisoma subcaeruleum	Chestnutvented titbabbler
Onychognathus nabouroup	Palewinged starling
Anas capensis	Cape teal
Vanellus armatus	Blacksmith plover
Recurvirostra avosetta	Pied avocet
Himantopus himantopus	Blackwinged stilt
Acrocephalus baeticatus	African marsh warbler
Prinia flavicans	Blackchested prinia
Motacilla capensis	Cape wagtail

3.9. SURFACE WATER

The rivers in and around the project area are normally dry from a surface water perspective. Occasionally storm water entering the rivers in the upland areas reaches the sea. Perennial surface water occurs at a few isolated points in the rivers, but subsurface water is present in the larger rivers all year. The Swakop and Khan are the major ephemeral rivers in the region, and are shown on Figure 1-1 and Figure 1-2. More detail on the subsurface water is provided in section 3.10 of the scoping report.

Drainage lines cross the project area in a north-east to south-west direction towards the Swakop River. Some of the drainage lines flow from west to north-west towards the Khan River.

3.10. GROUNDWATER

The Rössing South area is complex from a hydrogeological perspective. The highly variable geology has resulted in an area of variable, but low groundwater potential. Three different aquifer systems, all with relatively low supply potential, exist around the mine site including:

- saturated alluvium associated with major rivers (i.e. the Khan and Swakop rivers);
- saturated alluvium associated with the Rössing South plain; and
- fractured / weathered bedrock aquifers.

The highest inflows are encountered in alaskite zones and in areas of biotite schists. Inflow into future open pits is expected to occur predominantly along these zones with the majority of ground water evaporating prior to reaching the open pit floor, as flow rates are so low.

3.10.1. GROUNDWATER QUALITY

The water is saline, with the electrical conductivity varying between 5 and 34 milli-Siemens per cm (mS/cm). The general water quality of the water around the proposed mine, based on the abstraction bores, which have been used for the last year, is approximately 13 mS/cm.

3.10.2. GROUNDWATER USE

The only known groundwater user within 5km of the mine site, is the existing Rössing uranium mine, which abstracts water from the Khan alluvial aquifer. The boreholes are located approximately 3km to the northwest of the proposed Rossing South open cast mine area.

3.11. AIR QUALITY

Background air quality has not been determined for the region. Potential sources of air pollution in the vicinity of the project area include:

- windblown dust;
- dust (fallout and inhalable particulate matter), radon gas and ionising radiation generation from stockpiles, materials handling, material processing, mining, vehicle entrainment on gravel roads from surrounding mining operations);
- fume emissions from diesel generators, heaters/boilers;
- fume generation form vehicle exhaust systems; and possibly also
- greenhouse gases, ozone and chemical fumes.

In the project vicinity , potential receptors (receptors include people, flora, fauna etc. that are exposed to the potential impacts on air quality as described above) include Arandis (15km from the project site), Rössing uranium mine (5km from the project site), the natural environment and tourists that visit the various attractions in the Namib Naukluft Park.

3.12. NOISE

Existing noise sources within and around the project site include:

- natural sounds from wind, animals and birds;
- vehicle movement on the public road network; and
- operational activities from exploration activities and surrounding mines including: drilling, blasting; vehicle movement and materials processing.

Potential receptors of noise are the town of Arandis and tourists that frequent the various attractions in the Namib Naukluft Park, as well as fauna. The sensitivity of noise receptors usually increases at night when conditions are still and ambient noise levels are at their lowest.

3.13. HERITAGE RESOURCES

Archaeological sites have been discovered within and surrounding the project site. These include:

- stone artefact surface scatters;
- stone hunting blinds;
- rock shelter sites;
- seed digging sites;
- grinding surfaces; and
- historical artefacts from the recent past, e.g. the narrow gauge railway embankment.

3.14. SENSITIVE LANDSCAPES

The South African guidelines for integrated environmental management (IEM Guidelines – DEA, 1992) define "sensitive landscapes" broadly according to the categories listed in Table 3-5. The occurrence of sensitive landscapes in and around the project area is also given in Table 3-5.

TABLE 3-5: OCCURRENCE OF SENSITIVE LANDSCAPES IN THE PROPOSED PROJECT AREA

Categories	Occurrence in and around the project area
Nature conservation or ecologically sensitive areas - indigenous plant communities (particularly rare communities and forests), wetlands, rivers, riverbanks, lakes, islands, lagoons, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species.	The project area is located within the Namib Naukluft Park and incorporates some biodiversity with Red Data status.
Sensitive physical environments - such as unstable soils and geo-technically unstable areas.	None identified to date.
Important natural resources - river systems, ground water systems, high potential agricultural land.	The project area is located close to the Khan River.
Sites of special scientific interest.	The project site is located within the Namib Naukluft Park.
Sites of social significance - including sites of archaeological, historic, cultural, spiritual or religious importance and burial sites.	Archaeological sites have been identified in the ML and in close proximity to it as mentioned in section 3.13.
Sites of outstanding natural beauty, panoramic views and scenic drives.	Namib Naukluft Park, including specific areas such as the Welwitschia plains.
Green belts or public open space in municipal areas.	None identified to date.

3.15. VISUAL ASPECTS

One of the major attractions to tourists visiting the Namib Naukluft Park is the scenic beauty of the park, and the associated sense of place. This is primarily based on the lack of human activity and structures inside the park, coupled with a sense of remoteness and the value of the visual resource.

Most sensitive public views of the project site are from the Welwitschia plains, a tourist attraction approximately 15km to the south-west of the project area.

3.16. SOCIO-ECONOMIC STRUCTURE/PROFILE

The regional setting of the project area is included in Table 3-6 and illustrated in Figure 1-1 and Figure 1-2.

TABLE 3-6: REGIONAL SETTING

Region	Erongo Region
Local authorities	Erongo Regional Council; Arandis, Swakopmund and Walvis Bay Municipalities
National authorities	MET – Parks and Wildlife
Project location	Namib Naukluft Park
Closest towns/communities	Swakop River farmers, Swakopmund, Walvis Bay and Arandis.
Catchments	Khan River and Swakop River

3.16.1. SURFACE RIGHTS AND LAND TENURE

Land surface rights in the project area and the surrounding Namib Naukluft Park are owned by the Namibian Government care of the MET – Parks and Wildlife.

3.16.2. DEMOGRAPHIC CHARACTERISTICS

The population of the Erongo Region is relatively small and densities are low. Most of the population is found in urban areas with a majority living in the towns of Walvis Bay, Swakopmund, Omaruru, Karibib, Arandis, Usakos, Uis and Henties Bay. Socio-economic status varies from the extremely poor to the wealthy. This translates into a significant range in living standards with the poorer part of the population being exposed to greater challenges with regard to schooling, medical care, employment and the social and economic impact of HIV/AIDS.

3.16.3. ECONOMIC ENVIRONMENT

The main activities of the economy in the Erongo Region are:

- mining;
- fishing;
- tourism
- commercial farms;
- subsistence farming; and
- port-related activities.

The main economic activities in the Erongo Region are concentrated in the two coastal towns of Walvis Bay and Swakopmund, as well as the surrounding mines and exploration operations. The smaller towns offer limited employment opportunities, while opportunities in agriculture, small-scale farming and tourism are scattered widely throughout the region.

There is significant in-migration of people to Walvis Bay and Swakopmund in particular. People migrate to these areas for various reasons, but two of the more common reasons are to seek jobs and to establish businesses. The sectors that attract these people are mining, tourism, fishing and agriculture.

4. PROPOSED MINING OPERATION

4.1. OVERVIEW OF ACTIVITIES AND SURFACE INFRASTRUCTURE LAYOUT

A brief description of the project is given in the section below. The main aim of the project is to develop a uranium mine with a design capacity to produce between 4,000 and 7,000 tonnes of uranium oxide per annum. The mine is expected to comprise a conventional load and haul open cast operation, processing plant, mine residue disposal facilities and associated support infrastructure. The expected life of mine is at least 20 years.

At this stage in project planning, a number of alternatives are still under consideration. These alternatives are mentioned below as part of the proposed project description. The criteria for choosing between alternatives are discussed in Section 5 of the scoping report.

4.2. SITE LAYOUT / SURFACE INFRASTRUCTURE

The conceptual layouts for the surface infrastructure are illustrated on Figure 4-1 and Figure 4-2 . Figure 4.1 illustrates the base case scenario and Figure 4.2 illustrates an alternative scenario with high density tailings storage facilities. While the location and extent of the mining operation is fixed by geological constraints, alternative positions for the processing plant, mine residue disposal facilities, waste rock landforms and related surface infrastructure are still being considered. The final layout and site selection requires input from the additional work as set out in Section 7. This will be included in the EIA and EMP reports.

4.3. PROCESS DESCRIPTION

An overview of the conceptual project process is provided in Table 4-1 and a conceptual process flow diagram for the mine and plant is included in Figure 4-3.

4.4. SUPPORT FACILITIES

Associated support facilities identified to date include:

•	Temporary construction facilities and infrastructure.
•	Waste management: temporary handling and storage of general and hazardous waste, ablution facilities with sewage treatment plant.
•	Surface water management: water supply dams, mine residue facility, return water dams, pollution control dams, clean and dirty storm water controls.
•	Storage and handling of hazardous substances: fuel, lubricants, various process input chemicals, raw material stockpiles/bunkers, sulphuric acid, explosives.
•	Services: power lines, pipelines, roads, telephone lines, communication and lighting masts, railway line and siding.
•	Security and access control.

•	Lay down and storage yard areas.
•	Stores, workshops and wash bays.
•	Offices, control rooms.

FIGURE 4-1: CONCEPTUAL INFRASTRUCTURE LAYOUT – OPTION A

FIGURE 4-2 CONCEPTUAL INFRASTRUCTURE LAYOUT – OPTION B

FIGURE 4-3: CONCEPTUAL PROCESS FLOW DIAGRAM

TABLE 4-1: OVERVIEW OF THE PROPOSED PRODUCTION PROCESS

Component	Activities	Inputs/Outputs	Waste/emissions
Mining	*Opencast mining* Two areas of mineralisation have been defined in the proposed project area, namely Zone 1 and Zone 2 (Figure 4-1 and Figure 4-2). The Zone 1 open pit is expected to be approximately 2.8km long, 1.4km wide, with a surface area of about 2.6km^2. The Zone 2 pit is planned to be approximately 2.3km in length, 1.4km in width, with a surface area of about 2.2km^2. Both of the pits are expected to be mined to at least 350m in depth. However, resource definition drilling is still being completed and it is possible that the two open pits will join. Exploration drilling south of Zone 2 has also identified additional zones of uranium mineralisation that may be considered for mining if resources are defined. The open cast mining operation will include the removal of the thin gypsum crust in the area, as well as overburden. Drilling and blasting will be required to break up the rock in order to remove the waste rock. Ore-grade material will be extracted and taken to the plant by truck for processing.	Inputs Mining equipment Explosives Waste rock Process water Haul trucks Air Fuel Lubricants Transport vehicles Outputs Run of mine ore	Explosives packaging Vibrations Fly rock Process water Dust/fumes Noise Run off Seepage Temporary waste rock and run of mine stockpiles
Processing plant	*Crushing, milling and screening* At the plant the run of mine ore will be transferred to the crushing circuit. The circuit consists of primary and secondary crushing followed by a Crushed Ore Stockpile to provide storage capacity ahead of the tertiary crushing/grinding circuit. The crushed ore is reclaimed from the Crushed Ore Stockpile and conveyed to the High Pressure Grinding Rolls (HPGR) in closed circuit with a screen, with the screen undersize feeding a Ball Mill. Other crushing/grinding circuit flowsheets are also being considered.	Inputs Equipment, Uranium ore, Electricity, Water Outputs Slurry	Dust, Noise, Spillages.

Component	Activities	Inputs/Outputs	Waste/emissions
	Leaching The grinding circuit product flows to the leach circuit (agitated tank leach process), where concentrated sulphuric acid is added as the lixiviant and pyrolusite slurry and ferrous sulphate solution are added as the oxidant and oxidising agent, respectively. The leach circuit is operated at ambient temperature with no requirement for heating. Two types of leaching process are under consideration for the project, namely an agitated tank leach process for high grade ore, and a heap leach process for low grade ore. A combination of both processes may also be used. Heap leach process: Ore is placed on the heap leach pads. The ore is washed, and then leached using a sulphuric acid solution until it is considered to be barren. The pregnant leach solution will drain into collecting ponds.	Inputs: Equipment, Ore or slurry; Electricity, Water, Sulphuric Acid Pyrolusite Ferrous Sulphate Outputs Pregnant leach solution / slurry	Water spills Sulphuric acid spills Chemical spills Acid fumes Acid seepage
	Solid-Liquid Separation The leach circuit discharge is pumped to the solid-liquid separation circuit which consists of horizontal vacuum belt filters incorporating counter current washing. The washed filter cake is conveyed to the tailings storage facility, where it is stacked. The filtrate is clarified and then referred to as the pregnant leach solution (PLS). Alternate processes to belt filtration are being considered which may result in a high density slurry being pumped to the tailings storage facility.	Inputs: Equipment, Water, Electricity, Flocculant, Slurry Outputs: Pregnant leach solution Tailings	Solids Water

Component	Activities	Inputs/Outputs	Waste/emissions
	Ion exchange The PLS is pumped to the ion exchange (IX) circuit where it is contacted with IX resin. The uranium is adsorbed onto the resin and after the IX resin capacity is reached it is transferred to dedicated elution vessels, where the uranium is stripped off the resin to produce a concentrated stream (eluate) using sulphuric acid. The barren resin is returned to the adsorption circuit. The barren liquor from the IX adsorption circuit returns to the belt filters for use as wash liquor, with a portion neutralised with limestone and returned to the grinding circuit for use as mill feed water. The alternate solid/liquid separation process may result in the use of Resin In Pulp (RIP) to recover the uranium from solution. The RIP process is similar to IX but the uranium is recovered from a slurry rather than a solution.	Inputs: Electricity Water Pregnant uranium solution Resin Sulphuric acid Sodium bicarbonate Outputs: Eluate	Acid fumes Resin
	Solvent Extraction The eluate from the IX circuit is pumped to a solvent extraction (SX) circuit to remove impurities. The SX circuit consists of extract, scrub and strip units. In the extract units, the uranium transfers to the organic phase as it flows in a counter-current arrangement to the aqueous phase. The depleted aqueous phase (raffinate) is returned to the IX circuit. The organic phase consists mainly of a high flashpoint diluent, e.g. kerosene, with a small fraction of extractant, e.g. tertiary amine. The loaded organic phase is transferred to the three stage scrubbing circuit to ensure that any entrained impurities on the organic phase are removed and not carried forward into the strip stage. The scrubbed organic phase then advances to the strip units, where the uranium is transferred into an aqueous phase at a much higher concentration by the addition of ammonia. The loaded aqueous solution is then pumped to the precipitation circuit. Direct SX of the uranium from the leach liquor without inclusion of IX is also being considered.	Inputs: Eluate Electricity Water Organics Ammonium hydroxide Sodium carbonate Sodium hydroxide Outputs: Loaded aqueous solution	

Component	Activities	Inputs/Outputs	Waste/emissions
	Precipitation and calcination In the precipitation circuit, the loaded aqueous is contacted with ammonia gas to produce ammonium diuranate (ADU) precipitate. The ADU is dewatered, washed and calcined at approximately 800ºC before being packed into drums and stored in sea containers in preparation for shipment to port. The alternate use of hydrogen peroxide to precipitate the uranium as UO_4 is also being considered.	<u>Inputs:</u> Loaded aqueous solution Electricity Water Flocculant <u>Outputs:</u> Dry uranium oxide	
	Plant residue Waste solids from the belt thickener will be disposed through a tailings disposal process. Filter cake, high density tailings disposal and co-disposal options are under consideration.	Tailings	Tailings and return water spills, Seepage from mine tailings facility and return water facilities, Dust from mine tailings facility.
	Product Dry uranium oxide powder will be drummed for product dispatch. The drums of uranium oxide powder are expected to be stacked into sea containers and transported to the port of Walvis Bay for transport by ship to international customers.	Trucks Fuel and lubricants	Noise Truck emissions.

4.5. TRANSPORT ROUTES AND MECHANISMS

With reference to Figure 1-1 and Section 3.6.2, there is an existing network of roads in the project area that could be used for transportation of workers, goods and products associated with the proposed mine.

The following formal access routes to the site are under consideration:

- From the B2 near Arandis, across the Khan river to the site (approximately 30km); and
- From the C28 across the Swakop river to the site (approximately 38km).

4.6. POWER SUPPLY

It is estimated that approximately 35MW will be needed for the mining operation. Trolley assist is also being considered for the mining fleet. If this alternative is selected the power requirement could approximately double.

Discussions are currently being held with NamPower about the required power supply. Through this process, possible powerline routes including from the Kuiseb or proposed Husab substations will be identified. These powerline routes will form part of this EIA process.

4.7. WATER SUPPLY AND MANAGEMENT

4.7.1. WATER SUPPLY AND MANAGEMENT

It is proposed that water for the project will be sourced from NamWater, using desalinated water. Approximately 4 - 7 million m^3 of water will be required by the mine per year. Water will be transported to the mine site via a pipeline. The pipeline route is expected to run along the access road, and will form part of the EIA process.

Water management facilities for the control of storm water and for pollution prevention such as water supply dams, mine residue facility return water dams, pollution control dams, clean and dirty storm water controls will be designed to keep clean and dirty water systems separate. Preventing the discharge of dirty water and recycling of dirty water is a priority.

4.7.2. STREAM DIVERSION(S)

Project infrastructure will intercept various drainage lines across the project area.

4.8. SULPHURIC ACID SUPPLY

The acid leach process will require the use of sulphuric acid to extract uranium minerals from the ore. Acid consumption rates of approximately 24kg per tonne of ore are expected. Assuming a base case production of 15 million tonnes of ore per annum, approximatley 360,000 tonnes of sulphuric acid would be required per year. The following sulphuric acid supply alternatives are under consideration:

- Rail transport to a new siding near to the B2 or Rossing Mountain siding and by pipeline or road to site (across the Khan river);
- Rail transport directly from Walvis Bay to the C28 (across the Swakop river);
- Pipeline from Walvis Bay to the C28 and then across the Swakop River; or
- Acid plant on site with sulphur delivery by rail or road across the Khan or Swakop river.

4.9. WASTE MANAGEMENT

4.9.1. MINE AND PLANT RESIDUE

Details on the waste rock and tailings management have been provided in Table 4-1 above.

4.9.2. SEWAGE

It is proposed that there will be a sewage treatment facility located on site to cater for the proposed project. The location, design and capacity of these facilities will be determined during the planning and design phase of the project.

4.9.3. OTHER WASTE

The types of waste that will be generated by the project include: hazardous industrial waste (such as packaging for hazardous materials, used oil, grease, laboratory waste), general industrial waste (such as scrap metal and building rubble) and domestic waste (such as packaging and office waste). These wastes will be temporarily handled and stored on site before being removed for recycling by suppliers, reuse by scrap dealers or final disposal at permitted waste disposal facilities. No on-site landfill (waste disposal) facilities are planned for non mining waste types. A waste management procedure will be developed for these wastes.

4.10. INPUT MATERIALS

The following input materials will be used in the mining and processing operations:

Materials	Storage
Explosives	Explosives magazine and storage area
Sulphuric acid	Bunded containers

Diesel	Bunded containers
Lubricants	Warehouse
Chemicals	Warehouse
Building materials	Warehouse, storage yards
Tools, machinery	Warehouse, storage yards

4.11. EMPLOYMENT AND HOUSING

It is estimated that 2000 - 4000 jobs will be created during the construction phase of the project.

It is expected that between 500 and 1500 jobs will be created during the operation of the project.

Housing for permanent operational employees will not be provided on-site, it is expected that workers will be transported from nearby towns and settlements including Arandis, Walvis Bay and Swakopmund. During the construction period it is anticipated that workers will be accommodated in temporary accommodation on site.

4.12. TIMETABLE

Provided that a mining right which includes environmental authorisation is issued to Swakop Uranium, early stage project development and construction is expected to begin in late 2010.

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5. ALTERNATIVES

5.1. ALTERNATIVE LAND USES

Alternative land uses for the proposed project areas include conservation and/or mining related activities. When considering the post rehabilitation land use alternatives, the obvious option considered to date is rehabilitation back to some form of conservation/eco-tourism capability. This concept may be modified in consultation with relevant stakeholders during the mine life.

5.2. PROJECT ALTERNATIVES

As has been described in section 4 of the scoping report, alternatives are being considered for certain components of the project. For each component a set of selection criteria will be used to optimise environmental, technical and economic factors. The selection criteria for the various components are outlined below.

This alternative selection process cannot be completed without more detailed input from certain specialist investigations that have been described in section 7 of the scoping report. As such, the selection process, as outlined below, will be completed during the EIA/EMP phase.

5.2.1. ALTERNATIVE SURFACE INFRASTRUCTURE LAYOUT OPTIONS

As mentioned in section 4, various options for the position of certain surface infrastructure facilities (including the plant, tailings storage facility and waste rock dumps) are still being considered. The selection criteria are:

- ecological issues;
- archaeology/heritage issues;
- groundwater issues;
- surface water issues;
- land use issues;
- land capability issues;
- long term visual impact issues;
- carbon footprint considerations;
- air quality management;
- emergency management;
- sterilisation of mineral resources and
- economic factors relating to distances.

5.2.2. ALTERNATIVE PROCESSING METHODS

The processing options under consideration include an agitated acid tank leach process or heap leach processing. The acid tank leach process would require crushing, milling and acid leaching in tanks followed by processes to concentrate, purify and precipitate the uranium prior to product washing, calcining (or drying), and packaging. The heap leach process would require the ore to be stacked on lined leach pads with surrounding trenches and solution ponds for pregnant liquor storage. The uranium rich solution is then processed to concentrate, purify and precipitate the uranium from solution prior to product washing, calcining (or drying) and packaging. This process may require a larger crushing circuit than for the acid tank leach process. A combination of acid tank leach on higher grade ore and heap leaching of lower grade material is also under consideration.

Optimising the design for either process requires considering various combinations of commonly used crushing and grinding equipment. Comminution equipment under consideration includes:

- gyratory and cone crushers
- high pressure grinding rolls
- semi-autogenous mill
- ball mill
- rod mill
- screens

The selection criteria include:

- production issues (e.g. anticipated ore quality, leaching performance)
- dust control;
- power efficiency;
- liner and grinding media consumption;
- economic issues;

For either process a number of designs are being considered for processing the uranium rich leach slurry or solution from the leach stage. Processes being considered to concentrate, purify and precipitate the uranium include;

- cyclones and/or screens
- filtration
- counter current decantation
- resin in pulp
- ion exchange
- solvent extraction
- precipitation by various reagents, including ammonia, hydrogen peroxide, acid and alkali (all of these reagents are currently being safely used at one or other of the existing uranium plants in Namibia).

The selection criteria are:

- production issues (e.g. anticipated ore quality)
- water supply;
- power supply;
- reagent consumption;
- groundwater issues;
- surface water issues;
- land capability issues; and
- economic issues

5.2.3. ALTERNATIVE TAILINGS DISPOSAL OPTIONS

Alternative tailings dam disposal methods include filter cake, high density tailings disposal or co-disposal. The selection criteria are:

- water supply;
- groundwater issues;
- surface water issues;
- land capability issues;
- material properties;
- land use issues; and
- economic issues.

5.2.4. ALTERNATIVE WATER SUPPLY OPTIONS

The options for water supply include NamWater (desalination plant), private desalination plants and/or groundwater from the Khan River. The selection criteria are:

- the sustainability of both the resource and the supply;
- impact on existing water users; and
- economic considerations.

5.2.5. ALTERNATIVE POWER SUPPLY OPTIONS

The options for the power supply include NamPower, wind power, solar power or on site diesel generated power. In the context of solar power, the two sub-options include: solar panel power and solar thermal power. The selection criteria are:

- the availability and sustainability of the supply;
- impact on existing power users; and
- economic considerations.

Alternative routes for powerlines will need to be considered once the supplying substations have been identified.

5.2.6. ALTERNATIVE ACCESS ROUTE OPTIONS

The options for the access routes to the mine site include:

- road from the B2 near Arandis, across the Khan river to the site (approximately 30km); and/or
- road from the C28 across the Swakop river to the site (approximately 38km).

The selection criteria are:

- ecological issues;
- archaeology/heritage issues;
- surface water issues;
- land use issues;
- land capability issues;
- long term visual impact issues;
- emergency management;
- sterilisation of mineral resources and
- economic issues.

5.2.7. ALTERNATIVE SULPHURIC ACID SUPPLY OPTIONS

The following sulphuric acid supply alternatives are under consideration:

- Rail transport to a new siding near to the B2 or Rossing Mountain siding and by pipeline or road to site (across the Khan river);
- Rail transport directly from Walvis Bay to the C28 (across the Swakop river);
- Pipeline from Walvis Bay to the C28 and then across the Swakop River; or
- Acid plant on site with sulphur delivery by rail or road across the Khan or Swakop river.

The selection criteria are:

- ecological issues;
- archaeology/heritage issues;
- surface water issues;
- land use issues;
- land capability issues;
- emergency management;
- sterilisation of mineral resources and
- economic issues.

5.2.8. THE "NO PROJECT" OPTION

The assessment of this option requires a comparison between the options of proceeding with the project with that of not proceeding with the project. The assessment of this option requires input from the investigations described in section 7 so that the full extent of environmental, social and economic considerations can be taken into account.

6. IDENTIFICATION AND DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACTS

Potential impacts that were identified during the scoping process, in consultation with authorities, IAPs and specialists, are discussed under environmental component headings in this section. These discussions should be read with the corresponding descriptions of the current environment in section 3 of the scoping report.

Impacts of the various (surrounding/neighbouring) mining and exploration activities in the region will not, as a general rule, be cumulatively assessed in the EIA. It is understood that this regional cumulative assessment is the role of the strategic environmental assessment that was commenced for the uranium mining industry in the first quarter of 2009.

For projects with sufficient information at the scoping stage, preliminary impact assessments are provided in accordance with the methodology described in Table 6-1. In this scoping report a preliminary assessment is not possible. Before the assessment can be meaningfully conducted there is a need for additional information both from a number of specialist investigations and the project alternatives selection process. In addition, in some instances, the project alternatives selection process requires input from specialist investigations.

Against the above background, the potential impacts associated with all the phases (construction, operations, decommissioning and closure) have been conceptually identified and described and reference has been made to the studies/investigations that are required to provide the necessary additional information.

TABLE 6-1: CRITERIA FOR ASSESSING IMPACTS

Note: Both the criteria used to assess the impacts and the method of determining the significance of the impacts is outlined in the following table. Part A provides the definition for determining impact consequence (combining severity, spatial scale and duration) and impact significance (the overall rating of the impact). Impact consequence and significance are determined from Part B and C. The interpretation of the impact significance is given in Part D.

PART A: DEFINITION AND CRITERIA*		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of severity, spatial extent and duration**
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action. Irreplaceable loss of resources.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints. Noticeable loss of resources.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints. Limited loss of resources.

	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national

PART B: DETERMINING CONSEQUENCE

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

PART C: DETERMINING SIGNIFICANCE

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

PART D: INTERPRETATION OF SIGNIFICANCE

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

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

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

6.1. TOPOGRAPHY

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure

The following potential impacts on the topography may occur if the project is implemented:

- hazardous excavations and the dangers they present to animals and humans;
- alteration of drainage patterns;
- surface subsidence and the impact this can have on water drainage and topography; and
- visual aspects.

The additional work required to address this issue is described in section 7.1 of the scoping report.

6.2. SOILS

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure

Topsoil is generally a resource of high value containing a gene bank of seeds of indigenous species. A loss of topsoil (through sterilisation, erosion or contamination) would generally result in a decrease in the rehabilitation and future land use potential of any land that is disturbed by the project. In particular, the gypsum soil crust is seen as important soil component in the desert environment.

Specialist investigations are required to accurately map the soils, assess this potential impact and compile an appropriate soils conservation programme. The additional work required to address this issue is described in section 7.2 of the scoping report.

6.3. LAND CAPABILITY

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure

Capabilities for the project area have been identified in section 3.5. It is likely that conservation/eco-tourism is the most significant natural capability of the land. As the mine develops and disturbs additional land, the natural capability of the land can potentially be reduced. The additional work required to address this issue is described in section 7.2 of the scoping report.

6.4. LAND USE

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure

The project activities have the potential to negatively impact on both conservation efforts and the attractiveness of the area for eco-tourism. The additional work required to address this issue is described in section 7.3 of the scoping report.

6.5. NATURAL VEGETATION AND ANIMAL LIFE

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure

The development of the mine and associated infrastructure could cumulatively cause a loss of natural vegetation. This could lead to habitat fragmentation and degradation. It follows that the existence of and/or the habits of animal life (vertebrates and invertebrates) may also be impacted in a negative manner. Together, these impacts may cause a reduction in ecosystem functionality. The additional work required to address these issues is described in section 7.4 of the scoping report.

6.6. SURFACE WATER

6.6.1. ALTERING DRAINAGE PATTERNS

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure

Although rainfall is scarce in the region, significant rainfall events do occur and these events cause temporary flow of surface water. The proposed infrastructure could have a negative impact on drainage patterns. The selection of project alternatives will influence this impact to a limited extent. The additional work required to address this issue is described in section 7.5 of the scoping report.

6.6.2. CONTAMINATION OF SURFACE WATER

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure

Mining projects of this nature will generally present a number of pollution sources that can have a negative impact on surface and sub-surface water quality if unmanaged. Typically, the following pollution sources exist: fuel and lubricant spillage, sewage, mine residue (tailings, heap leach facilities, waste rock dumps and stockpiles), dirty water circuit, sulphuric acid and process chemical spillage, non-mineralised waste (hazardous, general, radioactive), and erosion of particles from exposed soils in the form of suspended solids. The additional work required to address this issue is described in section 7.5 of the scoping report.

6.7. GROUNDWATER

6.7.1. LOWERING GROUNDWATER LEVELS

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure

Groundwater levels could be reduced on-site by pit dewatering. This impact could be significant given the reliance of people and ecosystems on groundwater. Assessing the significance of this impact depends on the selected alternative and it requires input from the specialist investigation included in section 7.6 of the scoping report.

6.7.2. CONTAMINATION OF GROUNDWATER

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure

Groundwater could become contaminated from number of sources as detailed in section 6.6.2. The additional work required to address this issue is included in section 7.6 of the scoping report.

6.8. AIR QUALITY

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure

Mining projects present a number of air pollution sources that can cumulatively have a negative impact on ambient air quality, ecosystem functionality and surrounding land uses. The additional work required to address this issue is described in section 7.7 of the scoping report.

6.9. NOISE

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure
▨	▨	▨	

The project has the potential to generate noise that could be heard from surrounding areas, particularly at night when ambient noise levels are at their lowest. This can negatively impact on fauna and the wilderness experience that people expect when visiting the area from an eco-tourism or recreation perspective. The additional work required to address this issue is described in section 7.8 of the scoping report.

6.10. HERITAGE RESOURCES

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure
▨	▨	▨	

Heritage resources of varying significance have been identified in and around the project area. The impact of the proposed project on heritage resources may depend on the selected project alternatives. Given this, the process of selecting project alternatives should take the findings of the specialist investigation into account. The additional work required to address this issue is described in section 7.9 of the scoping report.

6.11. VISUAL

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure
▨	▨	▨	▨

The Namib Naukluft Park has a special sense of place and is a unique and valuable visual resource. Negative visual impacts are expected (day and night) as a result of the visual intrusion by existing and proposed infrastructure in the project area, specifically when viewed from the surrounding tourist attractions such as the Welwitschia plains. The additional work required to address this issue is outlined in section 7.10 of the scoping report.

6.12. SOCIO-ECONOMIC

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure
▨	▨	▨	▨

The proposed project could cumulatively have positive and/or negative impacts on the following:

- employment;
- the local and national economy,
- housing, health, schools and accommodation;
- the tourism sector;
- infrastructure such as water, power, transport; and
- integrated socio economic and environmental issues.

The additional work required to address these issues are outlined in section 7.11 of the scoping report.

6.13. RADIOLOGICAL

Phase in which impact(s) may occur

Construction	Operational	Decommissioning	Closure

Radiological impacts are an aspect of various impact types that have been discussed in section 7, which include potential impacts on groundwater, surface water, air quality, soils and ecology. In this regard, the existing activities and proposed project have the potential to contaminate the environment with ionising radiation, radon gas and radionuclides. These could be dispersed by groundwater, surface water and air. The related impacts extend from human health impacts to ecosystem functionality. The additional work required to address this issue is outlined in section 7.12 of the scoping report.

7. FURTHER INVESTIGATIONS

The proposed terms of reference for further investigations are discussed below. These investigations will cover construction, operation, decommissioning and closure phases where relevant and conceptual closure planning principles will be incorporated into the EIA and EMP reports. A draft EMP has not been provided with this scoping report because the input from the further investigations is required for the compilation of a meaningful EMP.

7.1. TOPOGRAPHY

It is proposed that further investigation into project alternatives (including their design and management) is required before the impacts on topography can be assessed by Metago and management measures provided in the EIA and EMP reports by Metago and Swakop Uranium. The alternatives under consideration are detailed in section 5 of the scoping report.

7.2. SOILS AND LAND CAPABILITY

It is proposed that a detailed investigation be conducted by Earth Science Solutions, which will include the proposed project site as well as road, power line, water pipeline and sulphuric acid pipeline routes. The investigation will have the following objectives:

- to provide a baseline assessment of the soil, land use and land capability of the undisturbed project area;
- to classify the different soil types and produce a soils distribution map;
- to confirm the natural land capabilities;
- to provide a profile of the soils, including the effective depth and occurrence of sub soils;
- to analyse properties and define characteristics of the soil such as nutrient content, chemistry, capability to support ecosystem functionality;
- to assess the cumulative impacts on soils and land capability; and
- to have input, together with Metago, other specialists and Swakop Uranium, into project alternatives and management measures going forward.

7.3. LAND USE

The selection of project alternatives and input from a range of specialist investigations is required before this impact can be assessed by Metago and management measures provided in the EIA and EMP reports by Metago and Swakop Uranium. The alternatives under consideration are detailed in section 5 of the scoping report. The terms of reference for the specialist investigations are included in section 7 of the scoping report.

7.4. NATURAL VEGETATION AND ANIMAL LIFE

It is proposed that the biodiversity assessment be conducted by African Wilderness Restoration, and will include the proposed project site as well as road, power line, water pipeline and sulphuric acid pipeline routes It is proposed that the assessments be undertaken in September 2009 (vegetation survey) and March - May 2010 (vegetation, vertebrate and invertebrate). The investigations will have the following objectives:

- to describe the vegetation found within the project boundary and surrounds
- to describe the vegetation communities/habitats for the proposed footprint and infrastructure areas (including structure, dominant plant composition and condition);
- to undertake mapping of each identified vegetation community/habitat;
- to identify flora and fauna linked to each habitat and document possible occurrence of endemic, Red Data / threatened species, species with medicinal / cultural value and alien / invasive species.
- to ranking each habitat based on conservation importance (in terms of national and provincial biodiversity priorities) and ecological sensitivity;
- undertake a landscape function analysis;
- to undertake identification of potential ecological impacts, with particular focus on:
    - the loss of general or sensitive habitats;
    - the potential loss of rare and threatened species;
    - the loss of open space;
    - the loss of natural migration corridors;
    - an assessment of cumulative impacts;
    - recommendations on management and mitigation measures (including opportunities and constraints) with regards to the construction and operation and future rehabilitation of the proposed development; and
    - to have input, together with Metago, other specialists and Swakop Uranium, into project alternatives and management measures going forward.

7.5. SURFACE WATER

It is proposed that a detailed investigation be conducted by Metago in collaboration with Metago Australia and Swakop Uranium. The investigation will have the following objectives:

- to identify surface water resources;
- to identify catchment boundaries;
- to calculate rainfall intensities, runoff, flood events and related flood lines;
- to identify pollution sources;
- to assess the cumulative impacts on surface water resources; and
- to have input, together with Metago, other specialists and Swakop Uranium, into project alternatives and management measures going forward.

7.6. GROUNDWATER

It is proposed that a detailed investigation be conducted by Aquaterra. The investigation will have the following objectives:

- to provide baseline water depths and qualities in and around the proposed project site;
- to identify fractures, faults and other relevant geological features that may be relevant to assessing the impacts of the various pollution sources;
- to identify all current and future pollution sources – including characterisation of the pollution concentrations and seepage rates;
- to model contaminant transport for the aquifers and possibly surface runoff;
- to model the impacts from pit dewatering;
- to assess the cumulative impacts on groundwater users and the ecosystem functionality; and
- to have input, together with Metago, other specialists and Swakop Uranium, into project alternatives and the management measures going forward.

7.7. AIR QUALITY

It is proposed that an air quality assessment be conducted by Airshed Planning Professionals. The investigation will have the following objectives:

- to undertake a baseline air quality survey for the project area and surrounds;
- to quantify all existing and proposed emission sources in an emissions inventory;
- to determine the relevant meteorological conditions in and adjacent to the project site;
- to model the cumulative spatial dispersion of emissions to air;
- to provide a basic assessment of the potential impacts of air quality on the health of mine employees;
- to provide a first level risk assessment of the cumulative off-site impacts that together with input from other specialists will enable a cumulative assessment on ecosystem functionality and surrounding land uses; and
- to have input, together with Metago, other specialists and Swakop Uranium, into project alternatives and the management measures going forward.

7.8. NOISE

It is proposed that Metago will:

- identify the noise sources associated with the existing activities and proposed project;
- qualitatively assess the cumulative noise impact on sensitive surrounding areas; and
- have input, together with other specialists and Swakop Uranium, into project alternatives and the management measures going forward.

7.9. HERITAGE RESOURCES

It is proposed that a detailed investigation be conducted by Quaternary Research Services. The specialist investigation, which will include the proposed project site as well as road, power line, water pipeline and sulphuric acid pipeline routes will have the following objectives:

- to update the existing basic heritage survey of EPL 3138 to focus on the project footprint area, as well as the additional linear infrastructure routes;
- to identify, classify and map all heritage resources in the proposed project area;
- to assess the cumulative impact on heritage resources; and
- to have input, together with Metago and Swakop Uranium, into the project alternatives and the heritage management measures going forward.

7.10. VISUAL

It is proposed that a detailed investigation be conducted by Newtown Landscape Architects. The investigation will have the following objectives:

- to define the visual resource and sense of place of the greater area;
- to identify the sensitive receptors/ lines of site (e.g. the Welwitschia plains);
- to determine the cumulative visual impact by simulating the key proposed infrastructure components of the project;
- to assess the cumulative visual impact; and
- to provide input, together with Metago, other specialists and Swakop Uranium, into the visual management measures going forward.

7.11. SOCIO ECONOMIC

It is proposed that a detailed socio-economic investigation be conducted by Metago Strategy4Good. The investigations will have the following objectives:

- to review existing social and economic data from the area, and to collect additional data where required;
- to interrogate the social and economic issues that were identified in the public participation process;
- to interview relevant stakeholders;
- to assess the potential positive and negative cumulative social and/or economic impacts; and
- to provide input, together with Metago, other specialists and Swakop Uranium, into the management measures going forward.

7.12. RADIOLOGICAL

It is proposed that a detailed investigation be conducted by NECSA. The investigation will have the following objectives:

- undertake a baseline study of ambient radiation levels in and around the project area (including dust, groundwater and plant material);
- identify and quantify the radiological pollution sources associated with the proposed project;
- the radiological study is a cross cutting study that from a pollution dispersion viewpoint must both provide input into the models and make use of the model conclusions of the air and water studies being conducted by Airshed Planning Professionals and Aquaterra. Discussions should also take place with the waste and water engineer to correctly understand the pollution emission issues associated with the tailings dam, potential heap leach facility, stockpiles and dirty water circuit;
- from a public health viewpoint, a clear distinction must be made between the project area that is managed in accordance with occupational health and safety legislation, and the area beyond this defined boundary that falls under environmental and public exposure criteria;
- assess the cumulative environmental and public exposure radiological impacts for all relevant pathways; and
- to provide input, together with Metago, other specialists and Swakop Uranium, into the management measures going forward.

8. WAY FORWARD

8.1. WAY FORWARD FOR THE SCOPING REPORT

The way forward for the scoping phase is as follows:

- distribute the scoping report and a summary thereof for review by the IAPs and authorities;
- receive comments from IAPs and authorities on 29 January 2010 (at the end of the 30 day review period);
- submit the scoping report (with comments) to MET; and
- receive comments from MET.

Review of scoping report by authorities and parastatals

Full copies of the draft scoping report will be distributed to the following authorities and parastatals:

- Ministry of Environment and Tourism – Parks and Wildlife (MET:P&W);
- Ministry of Mines and Energy (MME);
- Ministry of Agriculture, Water and Forestry (MWAF);
- National Heritage Council of Namibia (NHCN);
- Ministry of Health and Social Services (MHSS);
- Ministry of Labour and Social Welfare (MLSW);
- Ministry of Works, Transport and Communications;
- Chamber of Mines (CoM);
- NamWater; and
- NamPower.

Review of scoping report by IAPs

Full copies of the draft scoping report will be made available for public review at the following places:

- MET library and Namibian National Library in Windhoek;
- Walvis Bay public library;
- Swakopmund public library;
- Arandis public library and;
- Swakop Uranium Swakopmund office.

Electronic copies will be made available to IAPs on request (on a CD). A summary of the report has been compiled and distributed to all IAPs registered on the public involvement database.

IAPs comments on the scoping report should reach Metago by 29 January 2010. This gives IAPs 30 days to review the report. Comments should be made as follows:

- in writing directly to Metago via fax (+27 11-467 0978) and/or e-mail (joanna.goeller@metago.co.za or brandon@metago.co.za);

OR

- in writing to an independent in-country consultant – Alexandra Speiser (Fax: 061 233 679).

All comments received from IAPs will be addressed in the EIA/EMP.

Review of scoping report by MET

In February 2010, following the IAP and other authority review process, one copy of the scoping report (with IAP and authority comments) will be forwarded to MET.

8.2. PLAN OF STUDY FOR EIA AND EMP

The plan of study for the EIA and EMP is set out below:

8.2.1. DESCRIPTION OF THE TASKS PLANNED FOR THE EIA PROCESS

An overview of the EIA process highlighting each phase and corresponding activities is provided in section 1.3.1 of the scoping report. An outline of the planned specialist investigations is included in section 7 of the scoping report. The terms of reference of these tasks have been designed to address all the issues that have been identified in the scoping process and include the manner in which the tasks will be completed. The main component of the tasks is assessment work by specialists, Metago and the Swakop Uranium project team. The outcome of this set of tasks includes specialist reports and the EIA and EMP reports.

8.2.2. PROPOSED METHOD FOR ASSESSING ENVIRONMENTAL ISSUES AND ALTERNATIVES

Assessment of environmental issues

The proposed method for the assessment of environmental issues is set out in Table 6-1 of the scoping report. This assessment methodology enables the assessment of environmental issues including: cumulative impacts, the severity of impacts (including the nature of impacts), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

Assessment of alternatives

Project alternatives have been discussed in section 4 of this report, and the assessment criteria for choosing between these alternatives is included in section 5. The proposed methodology for the assessment of these alternatives is a relative comparison that also applies the assessment method that is set out in the Table 6-1 (described above) to each of the listed assessment criteria, where possible.

8.2.3. INVOLVEMENT OF AUTHORITIES IN THE EIA AND EMP PHASE

Review of the EIA and EMP reports by authorities

Copies of the EIA and EMP reports will be distributed for authority review in the same way as the scoping report. It is expected that the report will be distributed to the authorities in June 2010.

Review of the EIA and EMP reports by MET

Following public review (see below), one copy of the EIA and EMP reports (with IAP and authority comments) will be forwarded by Metago to MET. It is expected that the report will be distributed to the MET in June 2010.

Information-sharing meetings

If required, a general authorities meeting will be held at the end of the EIA phase to present the main findings of the EIA/EMP. The authorities that will be invited to attend this possible meeting include: MME, MET: P&W, MWAF, MLSW, NHCN, MHSS, CoM, NamPower, NamWater, the Erongo Regional Council and the local municipalities of Arandis, Swakopmund and Walvis Bay.

8.2.4. INVOLVEMENT OF IAPS THE EIA AND EMP PHASE

On completion of the EIA and EMP reports, copies of the report will be made available for IAP review at the same places as the scoping report (section 8.1). It is planned to distribute the EIA and EMP reports for public review in June 2010.

Electronic copies will be made available to IAPs on request (on a CD). A summary of the report will be compiled and distributed (by e-mail or post) to all IAPs registered on the public involvement database.

Public open days will be held at the end of the review period.

All comments received from IAPs in the review period will be included in the final report that is submitted to MET.

Once the MET has issued its record of decision, the IAPs will be notified by fax, e-mail or post in accordance with the instructions from the MET.

Colleen Parkins (PrSciNat) **Joanna Goeller (Project Manager)** **Brandon Stobart (EAPSA) (Reviewer)**

Metago Environmental Engineers (Pty) Ltd

APPENDIX A: INFORMATION-SHARING WITH AUTHORITIES

E-mail notification to MET of the project and the public meetings.

APPENDIX B: PUBLIC INVOLVEMENT DATABASE

APPENDIX C: INFORMATION SHARING WITH IAPS

- Background information document (BID).
- Newspaper advertisements.
- Site notices displayed in project area on 30 July 2009: Site notice in English and photographs of where site notices were placed.
- Minutes of scoping meeting held at the MME Auditorium in Windhoek on 11 August 2009.
- Minutes of scoping meeting held at the Namib Primary School in Swakopmund on 12 August 2009.
- Minutes of the scoping meeting held at the Arandis Town Hall on 13 August 2009.
- Minutes of scoping meeting held at the Walvis Bay library (side hall) on 13 August 2009.

APPENDIX D: SUMMARY OF ISSUES RAISED BY AUTHORITIES AND IAPS

APPENDIX E: CURRICULUM VITAE

Metago Environmental Engineers (Pty) Ltd
Consulting Engineers and Scientists

RECORD OF REPORT DISTRIBUTION

Project Number:	M009-03
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Report Number:	1
Proponent:	Swakop Uranium (Pty) Ltd

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