

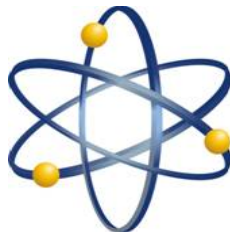


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**REPORT**

**Compiled for**

**REPTILE URANIUM NAMIBIA (PTY) LTD**



**SCOPING REPORT FOR THE  
ONGOLO PROJECT**

**Report No ONGSCOREP/2013/01**

**9 April 2013**



PO Box 1525, North Riding, 2162  
South Africa  
Cell: 082 554 8900  
Tel: 011 462 2985 Fax: 086 657 1612  
E-mail: francois@softchem.co.za  
Website: www.softchem.co.za

- water and waste management
- environmental management
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## SCOPING REPORT FOR THE ONGOLO PROJECT

Compiled by:

.....  
JFC Friend  
PrEng CEng

### Contributors

Mr P Christians

**Reptile Uranium Namibia (Pty) Ltd**

Mr K Frielingsdorf

**Reptile Uranium Namibia (Pty) Ltd**

Dr K Kärner

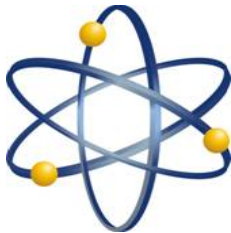
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## **EXECUTIVE SUMMARY**

Reptile Uranium Namibia (Pty) Ltd intends to submit a mining licence application for its Ongolo project on EPL3496 in the Namib-Naukluft Park to the competent Namibian authorities for the extraction of uranium and associated minerals. Before any mining licence can be granted, an environmental impact assessment process must be undertaken by the relevant applicant and authorised by the Ministry of Environment and Tourism. The compilation of this scoping report is a requirement of the environmental impact assessment regulations of Namibia.

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## 1. INTRODUCTION

Deep Yellow Limited (DYL) is an Australian-based uranium company with extensive operations in Namibia and Australia. DYL's principal exploration and development activity is in Namibia through its 100% owned subsidiary Reptile Uranium Namibia (Pty) Ltd (RUN), with one of its main development focuses being the Ongolo project situated on exclusive prospecting licence EPL3496.

### 1.1 Ongolo project outline

The Ongolo project consists of three discrete mineralised zones, Ongolo Main, Ongolo South and MS7, all of which are located on the proposed Ongolo mining licence area. The Ongolo project includes a processing plant to treat the ore from the Ongolo mineralised zones to produce uranium oxide as a final product.

Uranium mineralisation at Ongolo is hosted by leucogranites, commonly also referred to as alaskites. These alaskites occur as steeply dipping, sheeted or anastomosing veins in metasediments adjacent to a marble antiform. The primary ore mineral is uraninite. Its occurrence is often marked by the presence of significant smoky quartz and frequently, biotite. Secondary uranium mineralisation in the form of uranophane has also been identified, particularly within fracture zones of the deposits.

The Ongolo process flow alternatives that are currently being considered is the atmospheric sulphuric acid agitated tank leach process and the on-off sulphuric acid heap leach process. For the purpose of this scoping report, both alternative processes will be considered and evaluated in terms of the Ongolo EIA and EMP process.

The concentrator at Ongolo will process ore mined from Ongolo as well as from possible new mineralised alaskite discoveries on the proposed Ongolo mining licence area. Currently the location of the concentrator, waste rock and tailings storage facility cannot be determined exactly and several alternatives within the proposed mining licence area are being considered.

Trade-off and technical studies are also planned to possibly treat the ore from the already environmentally certified INCA project (Friend *et al.*, 2011) at the Ongolo processing facility, thereby reducing the overall environmental impact for both projects.

### 1.2 Environmental impact assessment

RUN intends to submit an application for a mining licence on EPL3496 in the Namib-Naukluft Park to the competent Namibian authorities for the extraction of uranium and associated minerals. However, before any mining licence can be granted, an environmental impact assessment (EIA) process must be undertaken by the relevant applicant and authorised by the Ministry of Environment and Tourism (NGR, 2012a). In terms of Section 3 of the EIA regulations (NGR, 2012b), RUN appointed Softchem as its environmental assessment practitioner (EAP) for this environmental impact assessment process and to compile this scoping report as a requirement in terms of Sections 7 and 8 of the EIA regulations (NGR, 2012b).

### 1.3 Scoping report structure

The EIA process followed for the Ongolo project, based on the Namibian Environmental Assessment Policy of 1995 and the EIA regulations of 2012, is basically illustrated in Figure 1.1 (Tarr and Figueira, 1999; SAIEA, 2003; SAIEA, 2010; NGR, 2012b). In terms of Section 8 of the EIA regulations the components of this scoping report are set out below, with references to the relevant sections within this report (NGR, 2012b):

- curriculum vitae of the EAP who prepared this report (Section 11),
- a description of the proposed activity (Section 3),
- a description of the site on which the activity is to be undertaken and the location of the activity on the site (Section 2),
- a description of the environment that may be affected by the proposed activity (Section 6) and the manner in which the geographical, physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed listed activity (Sections 4 and 8),
- an identification of laws and guidelines that have been considered in the preparation of the scoping report (Section 7),
- details of the public consultation process (Section 9),
- a description of the need and desirability of the proposed listed activity (Section 4);
- identified feasible and reasonable alternatives, inclusive of associated advantages and disadvantages (Section 5);
- a description of environmental issues and significant effects, including cumulative effects, that have been identified (Section 8),
- information on the methodology to be adopted in assessing the potential effects that have been identified, including any specialist studies or specialised processes to be undertaken (Section 8),
- a terms of reference for the detailed assessment (Section 10), and
- a draft environmental management plan (Section 12 and Appendix D).



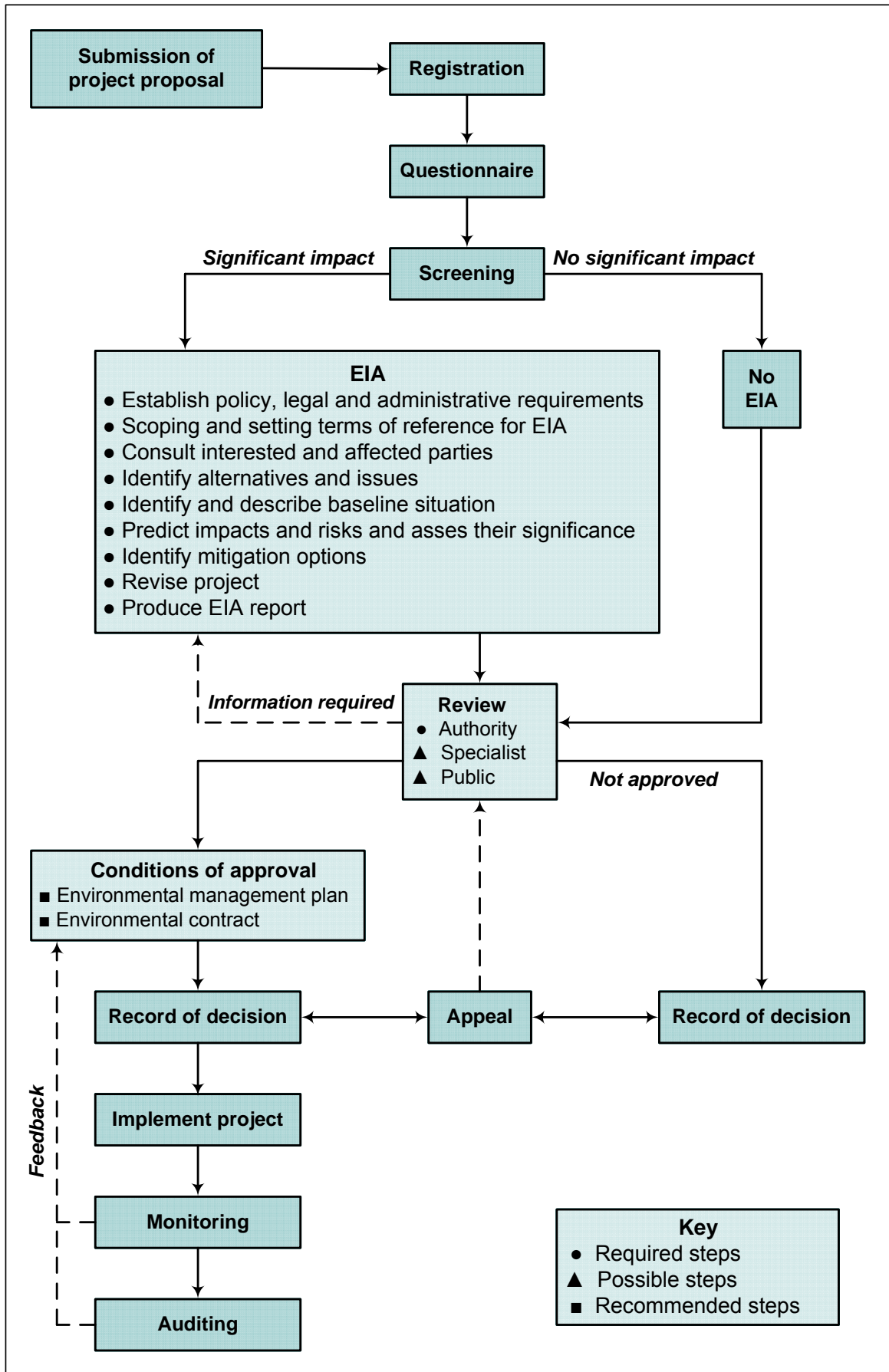


Figure 1.1 The environmental assessment process for projects in Namibia.

## 2. PROPERTY DESCRIPTION

### 2.1 Regional setting

RUN's Ongolo project is located in the west of central Namibia, Southern Africa; situated approximately 40 km east of the major deepwater seaport at Walvis Bay and east-southeast of the coastal town of Swakopmund. The location of the project in relation to the mentioned towns, as well as mining operations in the area, is shown in Figure 2.1. The regional setting in terms of climate, land cover and other regional characteristics is described in Section 6.

### 2.2 Proposed mining area

The proposed Ongolo mining licence area covers approximately 46 km<sup>2</sup> and is situated in the northern part of RUN's EPL3496, as illustrated in Figure 2.2. The coordinates of the proposed mining licence area are given in Table 2.1.

**Table 2.1** Coordinates of the proposed Ongolo mining licence area.

ID point	Longitude	Latitude
1	14.59599649	-22.47147272
2	14.57346256	-22.48544839
3	14.57072034	-22.48233210
4	14.57295536	-22.48063837
5	14.56144073	-22.47133495
6	14.54267427	-22.48408767
7	14.52396329	-22.48145274
8	14.52599904	-22.48000382
9	14.52599712	-22.47000691
10	14.59599649	-22.45000237

### 2.3 Land use

The proposed Ongolo project is contained within the Namib Naukluft Park, which is used primarily for tourism (see Figures 2.3 and 2.4). However, mineral exploration, drilling campaigns and mining operations have previously been undertaken near the proposed project site. A summary of current mining activities and proposed mining projects in the vicinity of the Ongolo project is given in Table 2.2. Illustrative examples of mining and other activities within the Namib Naukluft Park are given in Figures 2.5 to 2.8.

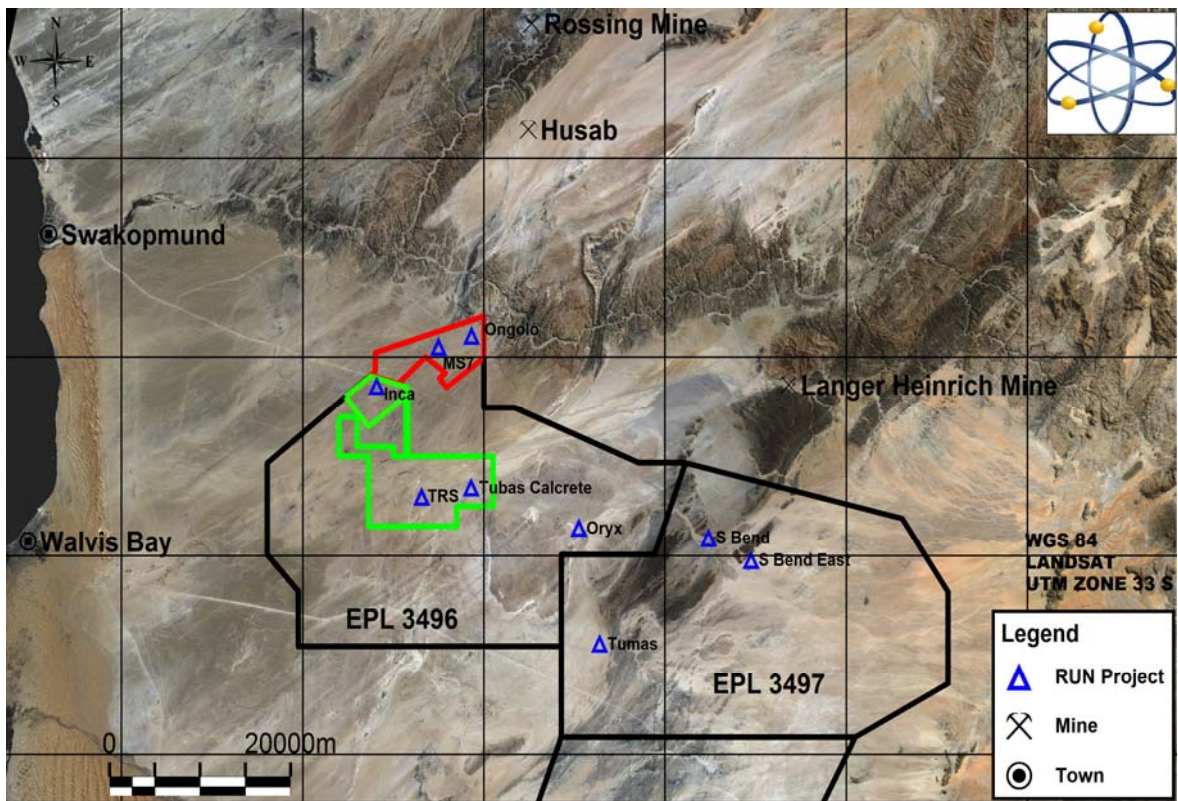


Figure 2.1 Location of the proposed Ongolo mining licence area (in red) on EPL3496.

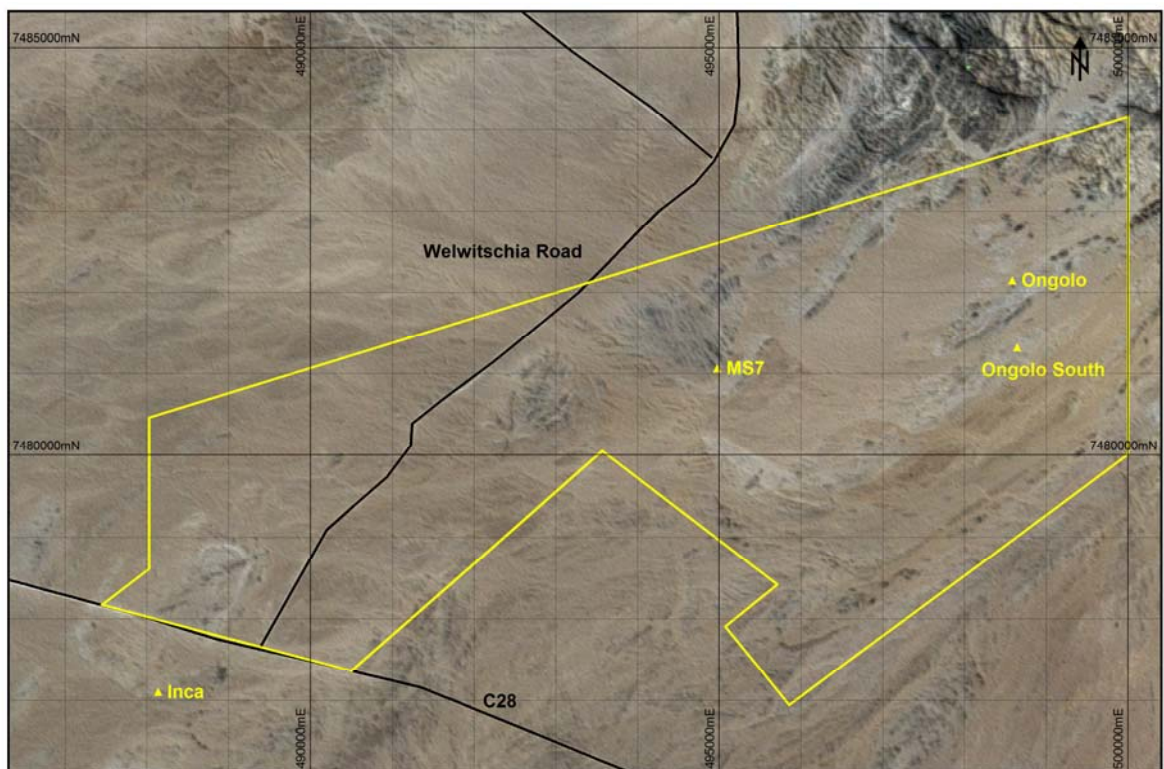


Figure 2.2 Location of the proposed Ongolo project area on EPL3496.

**Table 2.2** Significant mining projects in the vicinity of the proposed Ongolo project.

Company	Mining lease	Mineral	Status	Issue	Expiry	Comment
Rössing Uranium Ltd	ML28	uranium	granted (operating)	08/05/1985	07/05/2019	
Marlin Granite Namibia (Pty) Ltd	ML136	dimension stone	granted (operating)	14/04/2004	13/04/2014	
Langer Heinrich Uranium (Pty) Ltd	ML140	uranium	granted (operating)	26/07/2005	25/07/2030	within Namib Naukluft Park
Bannerman Mining Resources Namibia (Pty) Ltd	ML161	uranium	pending			within Namib Naukluft Park
Swakop Uranium (Pty) Ltd	ML171	uranium	granted (constructing)	29/11/2011	28/11/2036	within Namib Naukluft Park
Inca Mining (Pty) Ltd	ML173	uranium	pending			within Namib Naukluft Park
Shiyela Iron (Pty) Ltd	ML176	iron ore	granted	06/12/2012	05/12/2027	within Namib Naukluft Park



**Figure 2.3** Camping at Bloedkoppie, approximately 40 km east of the Ongolo project.



**Figure 2.4** Tourist spot – Big Welwitschia in the northern Namib Naukluft Park.



**Figure 2.5** Previous magnetite mining at Van Stryk mine on EPL3496.



**Figure 2.6** Active gypsum mining on EPL3496.



**Figure 2.7** Example of a mining operation within the Namib Naukluft Park.



**Figure 2.8** Example of a stone quarry within the Namib Naukluft Park.

### 3. DESCRIPTION OF THE PROPOSED ACTIVITY

The activities for the proposed Ongolo project include, *inter alia*, construction of mining infrastructure, open cast mining, loading and hauling, processing of ore, tailings storage facility, the transport of U<sub>3</sub>O<sub>8</sub> product, the disposal of waste rock, continuous rehabilitation and ultimately mine closure and final rehabilitation.

#### 3.1 Ongolo resource status

The Ongolo processing plant will be supplied with run of mine material from the resource that currently comprises of the three Ongolo deposits, namely Ongolo Main, Ongolo South and MS7. As at January 2013, the JORC Code\* compliant mineral resource for Ongolo is estimated at approximately 36.3 million tonnes (Mt) at an average grade of 396 ppm U<sub>3</sub>O<sub>8</sub> for 31.7 million pounds (Mlbs) U<sub>3</sub>O<sub>8</sub> at a cut-off grade of 250 ppm U<sub>3</sub>O<sub>8</sub> (see Table 3.1). (DYL, 2013)

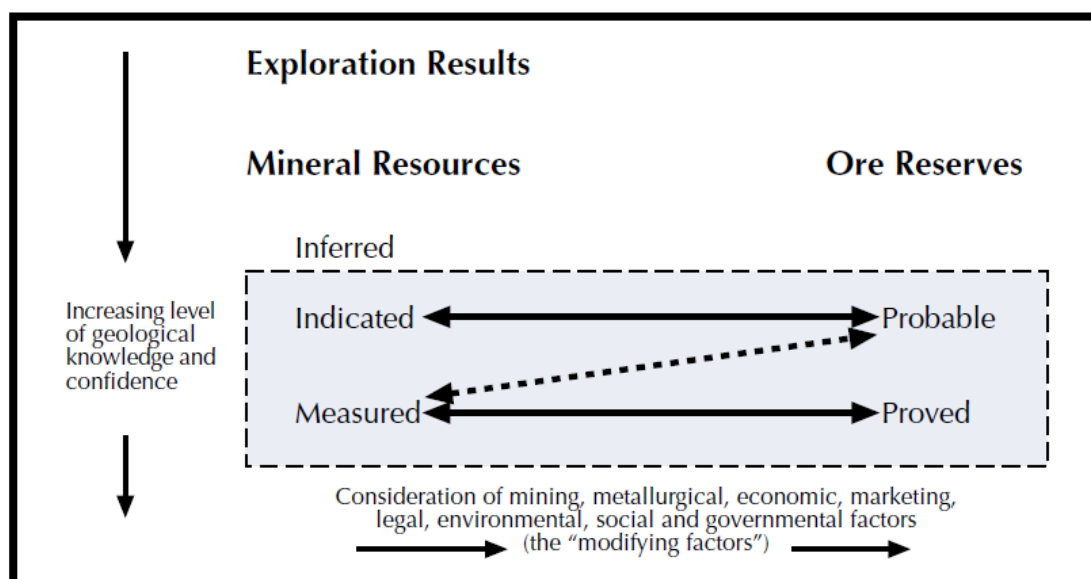
**Table 3.1** Current mineral resources estimate for the Ongolo project.

Deposit	Category	Cut-off (ppm U <sub>3</sub> O <sub>8</sub> )	Tonnes (M)	U <sub>3</sub> O <sub>8</sub> (ppm)	U <sub>3</sub> O <sub>8</sub> (t)	U <sub>3</sub> O <sub>8</sub> (Mlb)
Ongolo Main*	measured	250	7.7	395	3 040	6.7
Ongolo Main*	indicated	250	9.5	372	3 540	7.8
Ongolo Main and South*	inferred	250	12.4	387	4 810	10.6
Total Ongolo Main and South deposits			29.6	384	11 390	25.1
MS7*	measured	250	4.4	441	1 955	4.3
MS7*	indicated	250	1	433	433	1
MS7*	inferred	250	1.3	449	584	1.3
Total MS7 deposit			6.7	442	2 972	6.6
<b>Total Ongolo deposits</b>			<b>36.3</b>	<b>396</b>	<b>14 362</b>	<b>31.7</b>
<b>Notes:</b> Figures have been rounded and totals may reflect small rounding errors. XRF chemical analysis unless annotated otherwise. eU <sub>3</sub> O <sub>8</sub> - equivalent uranium grade as determined by downhole gamma logging. * Combined XRF fusion chemical assays and eU <sub>3</sub> O <sub>8</sub> values.						

\* *The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the 'JORC Code' or 'the Code') sets out minimum standards, recommendations and guidelines for public reporting in Australasia of exploration results, mineral resources and ore reserves. The Joint Ore Reserves Committee ('JORC') was established in 1971 and published several reports containing recommendations on the classification and public reporting of ore reserves prior to the release of the first edition of the JORC Code in 1989. Figure 3.1 sets out the framework for classifying tonnage and grade estimates to reflect different levels of geological confidence and different degrees of technical and economic evaluation. (AUSIMM, 2004)*

#### 3.2 Ongolo Main deposit

During January 2013 CSA Global updated the mineral resource estimate for the Ongolo project. This estimate includes the Ongolo South extension. The mineral resource estimate was completed using data from both fusion XRF assay results and gamma readings. The gamma readings were correlated with twinned chemical assay pairs and adjusted using a polynomial function to take into account local deposit factors, which affect the determination of the gamma equivalent U<sub>3</sub>O<sub>8</sub>. Where a drill hole sample has a chemical XRF analysis value, this was used in preference to the gamma value.



**Figure 3.1** General relationships between exploration results, mineral resources and ore reserves.

The mineral resource estimate was compiled using multiple indicator kriging (MIK), using parent block model dimensions of 25 m by 25 m by 6 m (X, Y and Z) with the grade tonnage results reported using a support correction function based on selective mining units (SMU) dimensions of 5 m by 5 m by 3 m. The mineral resource has been classified based on the JORC guidelines into measured, indicated and inferred categories, as shown in Table 3.1.

### 3.3 MS7 deposit

During November 2012, CSA Global updated the JORC compliant mineral resource estimate for MS7 based on drill data from 18 diamond drill holes and 354 reverse circulation (RC) holes, totalling 372 drill holes. Similarly as for the Ongolo Main deposit, the mineral resource estimate was completed using multiple indicator kriging (MIK), parent block model dimensions of 25 m by 25 m by 6 m (X, Y and Z) with the grade tonnage results reported using a support correction function based on SMU dimensions of 5 m by 5 m by 3 m; and the classification results presented in Table 3.1.

### 3.4 Ongolo project mining options

The mining area has positive geotechnical and hydrogeological attributes making it amenable to bulk open pit operations. It is envisaged that multiple satellite open pits will be mined with several pits being worked simultaneously. Barren top soil, approximately 0 m to 6 m in thickness, will be pre-stripped and stockpiled in close proximity to the open cast pit on a barren and environmentally low risk area. This top soil will be used for appropriate rehabilitation.

The ore at the Ongolo deposits is essentially hard rock that requires drill and blast followed by either of two options for recovery, namely either an excavator and haul truck mining operation or an in-pit crushing and conveying operation. These two options are described below.



### *Excavator and haul truck option*

With excavator and haul truck operations the uranium bearing ore, above a specific cut-off grade determined by ruling cost considerations and product price, will be mined in an open pit using excavators and trucks (see Figure 3.2). Radiometric truck scanners will allocate the run-of-mine (ROM) and waste rock material to various stockpiles. Graders and bull dozers assist with selective mining, general earthmoving and stockpiling as well as haul road construction and maintenance. Ore to waste ratios will vary from deposit to deposit, ranging from below 1:3 to as high as 1:8 for the various processing alternatives being considered. Local underground highly saline water, required for dust suppression, will be extracted from the open pit. Non-mineralised material will be stockpiled in close proximity to the open pit and where practical, may be used for backfilling.



**Figure 3.2** Open cast mining using excavator and haul truck mining method.

### *In-pit crushing and conveying option*

With in-pit crushing and conveying operations the uranium bearing ore, above a specific cut-off grade determined by ruling cost considerations and product price, will be mined in an open pit using shovels and front-end-loaders that will transport the run-of-mine (ROM) and waste rock material to an in-pit primary crusher (see Figure 3.3). Graders and bull dozers assist with selective mining, general earthmoving and stockpiling as well as haul road construction and maintenance. Ore to waste ratios will vary from deposit to deposit, ranging from below 3:1 to as high as 1:8 for the various processing alternatives being considered. An in-line radiometric discriminator will divert the non-mineralised material to a barren stockpile in close proximity to the open pit that may be used for backfilling. Mineralised ROM will be conveyed to various ROM stockpiles according to grade and other attributes. Local underground highly saline water, required for dust suppression, will be extracted from the open pit.

It is anticipated that the mining will be contracted out to a suitable mining contractor to reduce upfront capital cost. The proposed mining fleet will consist of three 550 tonne excavators, approximately fifteen 220 tonne dump trucks and three wheel loaders plus various earthmoving support equipment.



**Figure 3.3** Schematic of an open cast mine employing in-pit crushing and conveying mining method.

A pre-production period of two to four months will enable the establishment of mine roads, the ROM pad, pads and ponds, initial waste dumping area, tailings storage facility, ore stockpiles and pre-stripping of the satellite pits to support the steady state ore feed rate and to establish an approximately one million tonnes ore stockpile. Selective mining through detailed mine planning and grade control will ensure minimal ore dilution and maximise ore recovery. Grade control operations will include blast hole gamma probing, truck scanning, and geological modelling.

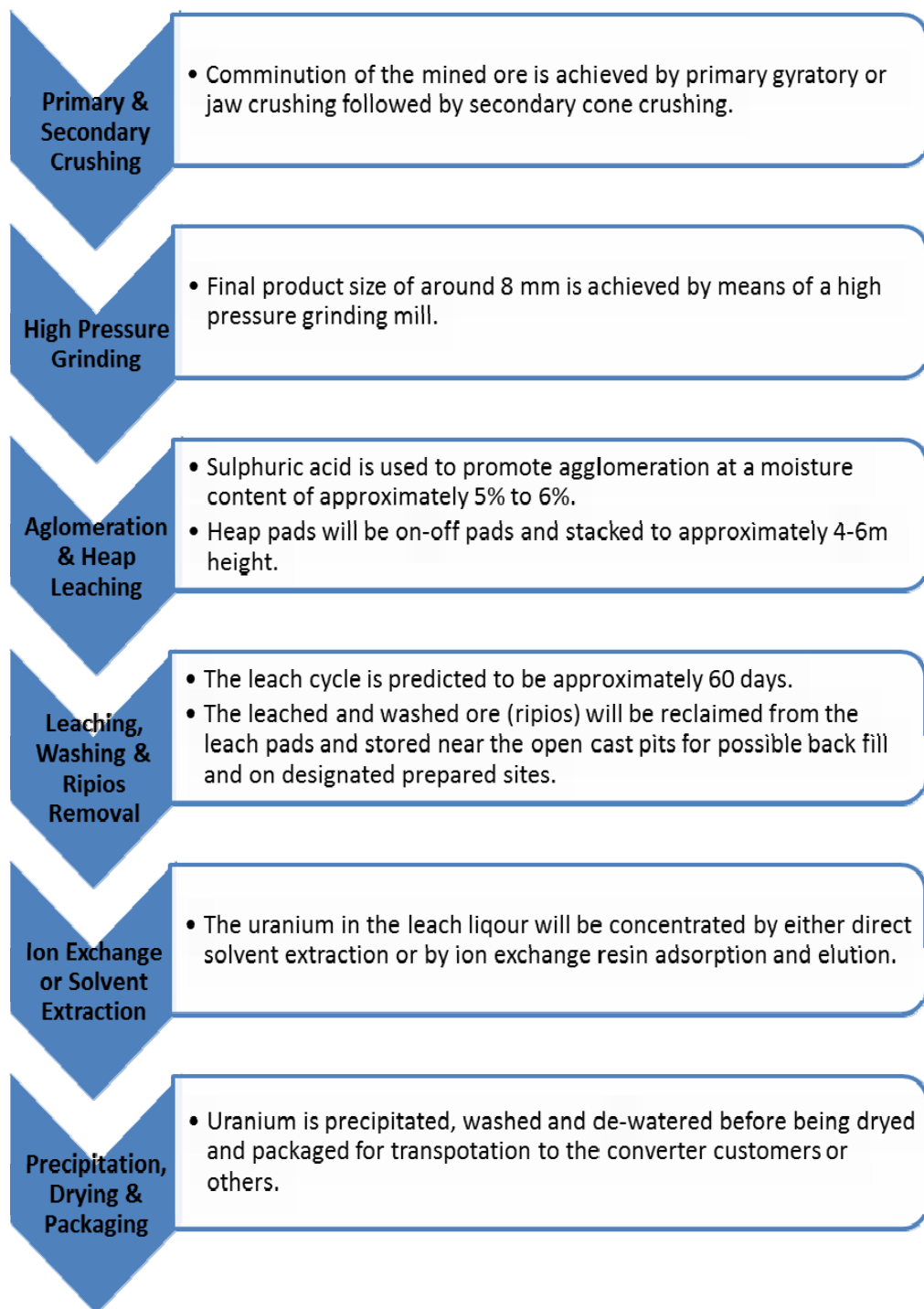
The large scale open pit operations will be scheduled seven days a week, 365 days per annum. The total annual ore and waste material movement from the mining operation will range from approximately 30 million tonnes per annum to 60 million tonnes for the various processing alternatives being considered. The ore/waste cut-off grade will range from 150 ppm  $U_3O_8$  to 250 ppm  $U_3O_8$  for the various processing options being considered. Barren waste rock and possibly tailings may be stored in mined-out satellite pits. Stockpiled top soil may eventually cover the backfilled area as well as barren stockpiles to blend in with the surroundings. The annual ROM ore feed rate will range from approximately three million tonnes to seven million tonnes for the various processing options being considered.

### **3.5 Ongolo process description**

Two different processing options are being considered for the Ongolo processing plant that will be used to treat the ore from the Ongolo deposits as well as the Inca deposit. The primary option being considered is a heap leach process flow, similarly to that employed at Areva's Trekkopje Mine. The second option being considered is an agitated tank leach process flow similar to that being used at Rössing Uranium mine.

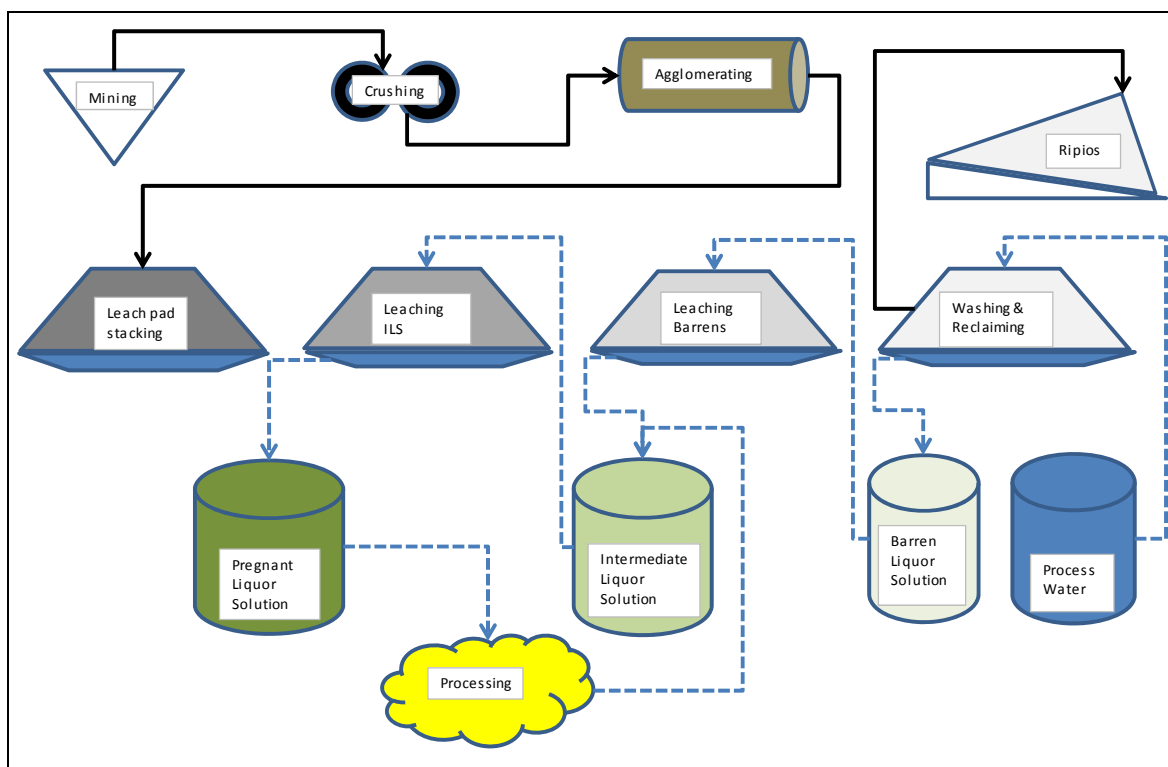
#### *Heap leach process*

The proposed heap leach process for the Ongolo process plant is illustrated via a simplified process flow diagram in Figure 3.4 and a schematic flow diagram in Figure 3.5; with the process described in more detail below.



**Figure 3.4** Simplified process flow diagram of an on-off heap leach with intermediate liquor solution process.

Material from the open pits will be stored on a ROM pad in various stockpiles according to uranium grade and geology. Approximately seven million tonnes per annum ROM will be either fed directly into the gyratory crusher or, alternately, over a vibrating grizzly into the primary jaw crusher. A secondary cone crusher will reduce the particle size to feed the high pressure grinding mills. Screens between the secondary cone crusher and the high pressure grinding mills will ensure that only oversized material will be milled. The milled ore will be screened with the screen underflow being combined with the secondary cone crusher screen underflow to produce material suitable for agglomeration and stacking on the heap leach pads. The oversize of the mill screen will be re-circulated to the high pressure grinding mill.



**Figure 3.5** Schematic flow diagram of an on-off heap leach system using intermediate liquor solution.

At all transfer and dust generating points dust control systems will be put in place in order to minimise dust escape and to collect dust for agglomeration and leaching. Dust control systems will be a combination of dry and wet control systems.

The milled ore will be agglomerated using 8 kg/t sulphuric acid and water to a final moisture content of 5% to 6% in a suitable agglomerating drum of approximately 3 m - 4 m diameter and 8 m - 10 m in length. The agglomerated ore will be stacked on a race track type on-off heap leach pad. An overland conveyor will transport the agglomerated ore to an auto stacker on crawlers. A tripper will place the agglomerated ore evenly to a height of approximately 4 m - 6 m on top of the heap leach pad drainage layer.

The leached and washed ore (ripios - leached ore residue) will be removed from the heap leach pad by a bucket wheel reclaimer on crawlers. An overland conveyor will transport the ripios to a ripios stacking system on a designated area. The footprint of the ripios stockpiles will be optimised to conform to environmental management plans. A storm water run-off management system will be in place to ensure storm water is collected in a lined pond and will not run off into the environment. Water collected from the ripios will be used in the leach circuit.

The heap leach pad will be prepared by profiling a race track area sufficient to accommodate the ore quantities required to sustain an approximately 3.5 million pounds uranium ore concentrate per annum operation. The profiled area will be filled and compacted with suitable material to accommodate a geotextile layer filled with clay and or bentonite. An impermeable polypropylene lining will be placed over the geotextile layer and drainage pipes will be placed on the polypropylene liner. Acid resistant rock (1 m - 1.5 m of approximately 25 mm size) will be placed over the polypropylene liner and drainage pipes to form the drainage layer that will protect the liner and drainage pipes.

Stacking and reclaiming will occur simultaneously at steady state. The race track heap leach pad will be divided into cells of different sizes and each cell in turn will be divided into several sub-cells. At any given point during steady state a sub-cell will be stacked, a cluster of sub-cells will be prepared for irrigation, a cluster of sub-cells will be leached with interstitial liquor solution (ILS), a cluster of sub-cells will be leached with raffinate (uranium depleted solution from solvent extraction) or eluent (uranium depleted solution from ion exchange), a cluster of sub-cells will be washed and allowed to drain and ripios will be reclaimed from a sub-cell. Uranium depleted solution will be used for leaching in order to produce ILS.

Pregnant liquor solution (PLS) is formed from the leachate of the cluster of sub-cells irrigated with ILS and interstitial liquor solution is formed from leachate of the cluster of sub-cells irrigated with raffinate or eluent. Wash, interstitial liquor solution and raffinate/eluent liquors will be stored in lined ponds with sufficient capacity to supply liquor on the just-in-time principle. This will ensure lowest cost and will reduce environment, health and safety risks.

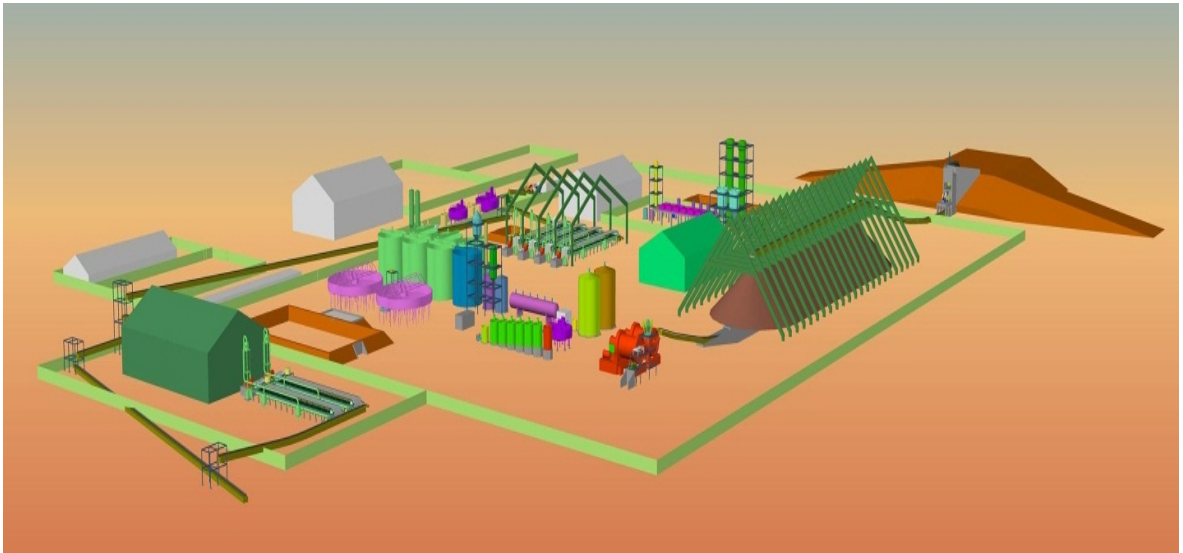
Once again two alternatives are available for further treatment, namely either solvent treatment or ion exchange. Solvent extraction entails extraction of uranium from the aqueous PLS to the organic phase, consisting of a mixture of alamine, isodecanol and kerosene diluent. This is followed by scrubbing of the loaded organic phase with dilute sulphuric acid and ammonium hydroxide at pH 2.2 to remove impurities such as iron and chloride from the organic phase. Uranium is recovered from the scrubbed organic phase using an aqueous solution consisting of ammonium sulphate and ammonium hydroxide, with the latter to increase the pH of the organic phase to 5.5. The ratio of organic to aqueous is approximately 6:1, resulting in a significant increase in uranium content in the aqueous liquor. Finally, uranium is precipitated from the aqueous liquor by adding ammonia in a reactor that reacts with dissolved uranyl sulphate to form solid ammonia diuranate (ADU) that precipitates. ADU is converted to uranium ore concentrate by washing, de-watering and finally calcining at approximately 800°C.

Ion exchange entails loading uranium onto ion exchange resin, possible scrubbing of resin to remove impurities, elution of uranium from the ion exchange resin and precipitation of uranium from the eluate. PLS is contacted with a suitable ion exchange resin in a counter current system. This ensures maximum recovery of uranium from solution. Impurities may be removed by treating the loaded resin with a scrubbing solution if desired. The loaded resin is treated with a suitable eluent that displaces the adhered uranium from the ion exchange resin in minimum volume. This results in a significant increase of uranium content in the eluate that is suitable for direct uranium precipitation using an oxidising agent such as hydrogen peroxide. The uranium oxide is washed, de-watered and dried at approximately 375°C to form U<sub>3</sub>O<sub>8</sub> concentrate.

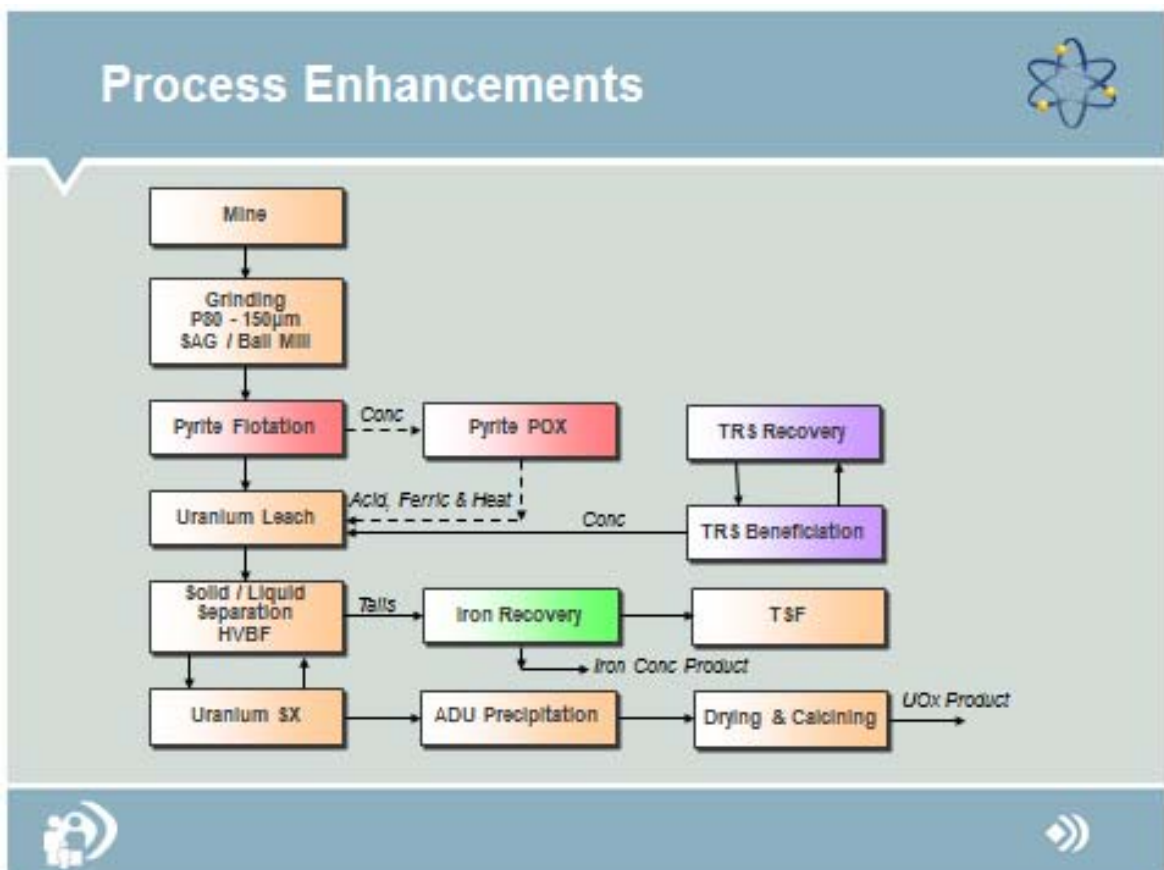
#### *Tank leach process*

The tank leach process follows a similar process flow to the heap leach, however, the tank leach process differs in the physical processing of ore and slurry and liquor management (see plant schematic in Figure 3.6 and process flow diagram in Figure 3.7). For tank leaching the operating costs as well as capital costs are higher, which requires a higher ROM grade to be economic.

The comminution circuit will consist of a primary crusher followed by either a primary semi-autogenous grinding (SAG) mill or an autogenous grinding (AG) mill; followed by possibly a secondary ball mill. The optimum grind size for leaching is estimated at 80%, passing approximately 350 µm. Screens, cyclones and re-circulation systems will ensure that an optimum particle size distribution for leaching is achieved.



**Figure 3.6** Proposed Ongolo plant schematic, including sulphide flotation, pressure oxidation and iron recovery plant.



**Figure 3.7** Proposed Ongolo process flow diagram, including sulphide flotation, pressure oxidation, iron recovery plant and Tubas Red Sand concentrate leaching.

The milled ore slurry will be thickened to approximately 50% solids and fed to the agitated atmospheric leach tanks. Sulphuric acid, ferric and pyrolusite oxidant will be added to the leach tanks in order to achieve and maintain optimum lixivate (leach) composition at approximately pH 1.5 (at least 4 g/l free sulphuric acid) and a redox potential of 450 mV. Sufficient leach tank volume will be built to ensure an approximate 12-hour leach residence time is maintained.

Solid liquid separation will be performed by a five-stage counter current decantation circuit. This will ensure that entrained leach liquor is washed out of the slurry and optimise water loss. However, the counter current decantation circuit will result in slight dilution of the PLS that will require a larger ion exchange and/or solvent extraction circuit compared to the heap leach operation. The clarified PLS will follow the same process alternatives as per the heap leach alternative.

The proposed Ongolo plant has an optional sulphide flotation circuit and an autoclave that will enable the recovery of pyrite and pyrrhotite and conversion to sulphuric acid from the ore. The proposed plant will have the capacity to process the Tubas Red Sands (TRS) concentrate by feeding the concentrate directly into the leach stream (see Figure 3.7).

Furthermore, a wet magnetic separation plant could be added to the process that will enable the recovery of magnetite iron ore y-product from the tailings for potential sale to existing and future acid leach uranium operations.

The proposed chemicals and other reagents to be used for either the heap leach or the tank leach process alternatives are similar. However, their rate of use within each process may differ. Table 3.2 lists the chemicals and reagents that will most likely be utilised in either process.

**Table 3.2** Probable reagent use for tank leach process for ion exchange and solvent extraction.

Reagent	Unit	Quantity per annum
Sulphuric acid	t	190 000
Lime	t	6 500
Pyrolusite	t	20 000
Flocculent	t	1 100
Coagulant	t	100
Ion exchange resin	m <sup>3</sup>	175
Extractant	t	2.50
Diluent	t	200
Modifier	m <sup>3</sup>	3.00
Sodium carbonate	t	1 500
Sodium hydroxide	t	8 500
Hydrogen peroxide	t	650

### 3.6 Tailings storage facility

The tailings storage facility will be located and designed such as to minimise environmental impacts and the size of the footprint, achieving lowest cost of construction and operation and to ensure long term safe storage of the tailings. The tailings from the heap leach operation (ripios) will be dry tailings and will most likely be conjoined with waste rock material. A significant portion of the waste rock will consist of marble. The presence of marble mixed with ripios will stabilise and negate potential acid formation. It is envisaged that the ripios waste rock tailings storage area will be un-lined, however, storm water run-off facilities will be incorporated to prevent ripios and waste rock dispersion into the environment.

The tank leach tailings will be wet and the tailings storage facility will be designed accordingly. The tailings ponds may be lined or partially lined and the location will be selected such as to minimise the potential for ground water contamination and run-off into the environment. Water reclamation will be designed into the tailings storage facility in order to minimise potential environmental impacts and to recover water and potential reagents and product.

Tailings monitoring systems will be incorporated for the wet as well as for the dry tailings storage facilities. Monitoring will include, *inter alia*, underground water quality and quantity, dust, radiation, water reclamation and movement of the storage facility.

### 3.7 Water reticulation and requirements

Application has been made to NamWater for a total of three million cubic metres of fresh water a year. It is estimated that the heap leach water requirement will be 1.65 Mm<sup>3</sup> per annum, which includes water for mining, processing, infrastructure and administration. The estimated water consumption for the tank leach alternative will be 1.25 Mm<sup>3</sup> per annum. Given the diminishing volumes of water available from the Omdel and Kuiseb aquifer systems it is likely that only desalinated water will be available from NamWater.

Supply by NamWater could be supplemented by highly saline raw underground water recovered from pit de-watering and possibly purpose built bore fields will be used for dust suppression in the plant, mining and hauling activities. Either untreated or partially desalinated underground water from pit de-watering could possibly be used as process water. However, advancement in resin technology has opened the opportunity to perform tank leaching as well as heap leaching using untreated seawater. The ion exchange resin capable of loading uranium in a hyper saline solution has been under development for some years and its mechanism of adsorption is based on the so-called chelating principle.

Laboratory scale tests are being conducted to prove the technology and to assess its economic feasibility. The salinity of seawater appears to be lower than that of the area's ground water and therefore leach and chelating resin in pulp tests using the hyper saline groundwater will also be conducted.

Potable and product washing water will require complete desalination treatment by either reverse osmosis or mechanical vapour compression technology (pilot plant tests have indicated 70% recoveries and low pressures).

Water required for fire fighting will be extracted from the raw water reservoir. The reservoir will be designed to meet the legal requirements for fire water storage volume. This implies that the suction for the fire fighting pumps will be lower than the suction for all other raw water pumping systems by an amount that accommodates the legal storage volume. Fire fighting water will be supplied to the required areas using an electric pump, augmented by a diesel driven fire fighting water pump as back-up in the event of a power outage. A dedicated diesel tank will be provided for the diesel driven fire fighting water pump.



The amount of water for the system will be designed to meet any fire response requirements based on a two hour residence for the maximum flow rate and will be fed via a pressurised ring main. The fire detection systems will consist of the following:

- fire alarm sensors in all buildings, activated by smoke detection, as well as manual “break-glass” units as appropriate;
- local fire alarm annunciator panels per building or group of detectors;
- potential free-contactors to allow feedback to the programmable logic controller (PLC);
- manual call points per annunciator panel; and
- sirens/strobes per annunciator panel.

### **3.8 Electricity supply**

The proposed mining site is in the vicinity of the Kuiseb substation. The substation is connected to Ruacana and Windhoek by 220 kV transmission lines. The electricity supplier, NamPower, has spare capacity that will be allotted to new mine developments on a first come, first served basis.

Currently this substation must be upgraded to satisfy the increasing demand by the development of new uranium mines in the area, as well as the increasing demand from both the Swakopmund and Walvis Bay municipalities. All outgoing feeders from the substation are currently rated at 66 kV, but have to be upgraded to 132 kV.

The proposed heap leach plant alternative will have an installed power of approximately 17.5 MVA, whereas the proposed tank leach option will have an installed power of approximately 23.5 MVA. It is envisaged that two 10 MVA 132/11 kV transformers will be installed. Plant reticulation to the motor control centres (MCC) will be 11 kV. Plant process reticulation will be 550 V and motors in excess of 350 kW, direct on line (DOL), will be supplied at 3 300 V. Small power and lighting will be at 400 V and emergency power will be produced by three 1 000 kVA diesel units. However, the design will be modular so that it can be adapted to process requirements.

During the construction and commissioning of the NamPower transmission line the process plant will be supplied by a temporary semi-mobile diesel generating set.

### **3.9 Access road**

The most acceptable access road to the mine site would be via the C28 national road and the existing park road leading off the C28 road, which is currently used by RUN to conduct exploration its activities (see Figure 3.8). However, a number of access points to the site are feasible and the final access road to site will be as permitted by the Roads Authority, as the mining licence application area abuts their easement.

### **3.10 Other site infrastructure/requirements**

Compressed air will be required at the process plant (plant air) and for instrument operation (instrumentation air). Two air compressors, one operating and one on stand-by will provide the compressed air requirements for the process plant. Each compressor will have an internal air drier and air filter. Two air receivers will be installed to supply the plant air reticulation and one instrument air receiver will supply the instrumentation air reticulation. In the proposed site layout allowance has been made for the following buildings and facilities within the plant area:

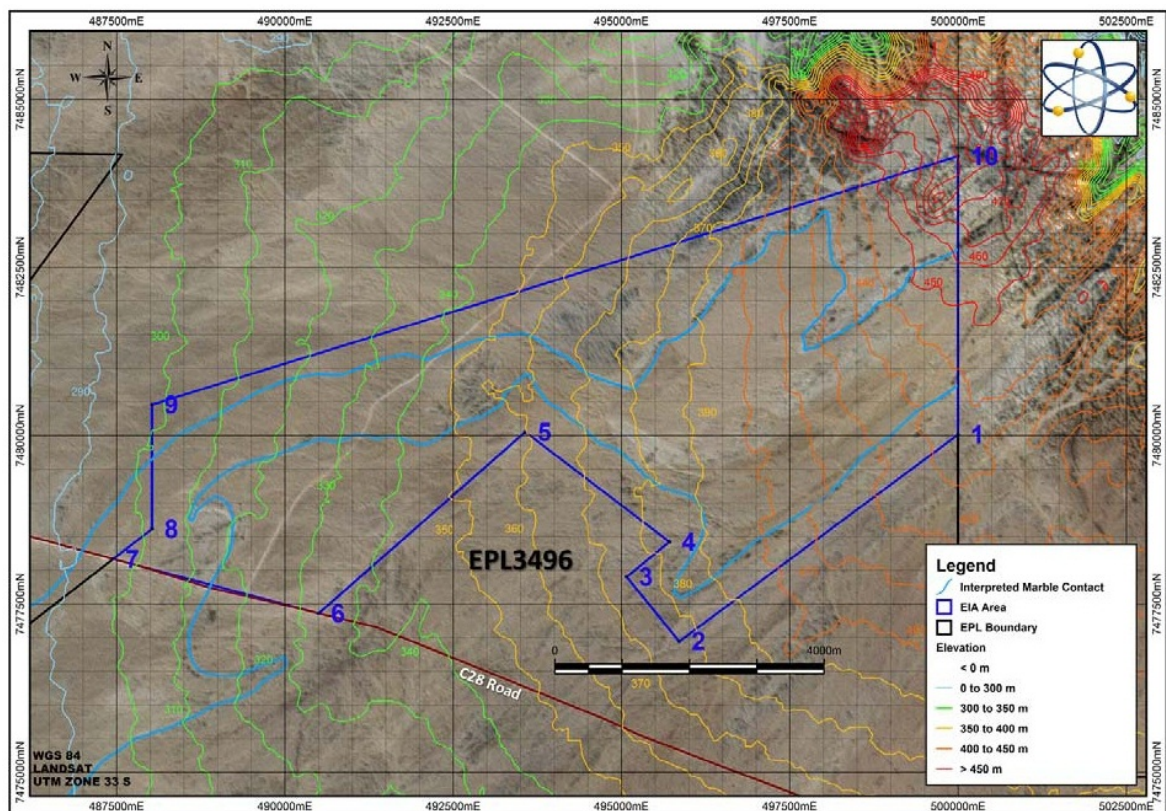
- gate house,
- administration building,
- change house,

- laboratory,
- medical building,
- electrical substations and motor control centres,
- central control room, and
- workshop.

All buildings will be “modular” type structures placed on an engineered terrace with a concrete floor slab, with adequate sanitary facilities and air conditioning as required. Steel structures will include the general workshop and stores building, pipe and cable racking and miscellaneous access platforms and walkways.

No need for onsite housing is foreseen for either the construction or production phase of the project. Housing would be located in either Walvis Bay or Swakopmund. However, during the plant start-up and commissioning phase an emergency dormitory will be available on site with a limited number of beds and ablution facilities.

General waste will be deemed to consist of domestic waste (comprising primarily of food wastes from the cafeteria and office waste) and industrial waste consisting of construction waste (concrete, wood, metal, and other scraps), empty non-hazardous reagent containers, tyres, and other waste products from the construction and operations stages. General provision will be made for disposal of all waste material at offsite licenced refuse/disposal sites as the site is located within a national park.



**Figure 3.8** Location of the Ongolo project area (blue outline) in relation to the C28 national road.

It is envisaged that the onsite communications and information management systems will consist of the following:

- telecommunication system,
- two-way radio system,
- security and closed circuit television (CCTV),
- access control,
- office local area network (LAN),
- supervisory control and data acquisition (SCADA), and
- central electronic control room.

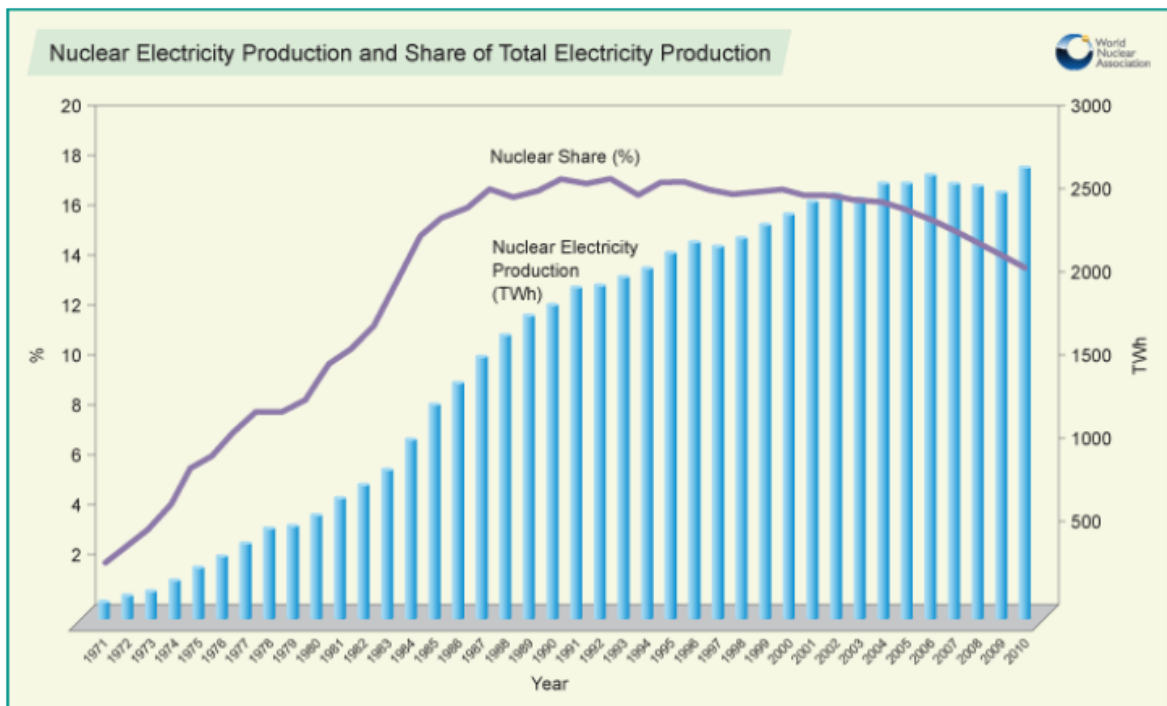
The plant organigram at full production has been developed from first principles based on industry standards and experience of existing operations. It is foreseen that some non-core activities will be sub-contracted to external service providers. A total complement of 180 personnel is anticipated for the Ongolo business operation at full capacity. Working hours for the mine site and processing plant will be 24 hours per day, seven days a week.

## 4. NEED AND DESIRABILITY OF THE PROPOSED ACTIVITY

### 4.1 Demand for uranium

Uranium is used for peaceful purposes in the nuclear industry for the production of electricity. Nuclear power currently represents 13.4% of electricity generated worldwide, with the balance produced by coal 40.8%, hydro 16.2%, gas 21.3%, oil 5.5% and wind and other sources 2.8%. Sixteen countries depend on nuclear power for at least a quarter of their electricity, with France obtaining around three quarters of their power supply from nuclear energy. Countries like Belgium, Bulgaria, Czech Republic, Hungary, Slovakia, South Korea, Sweden, Switzerland, Slovenia and the Ukraine get one third or more of their electricity demands from nuclear power. (WNA, 2013a)

The countries with the largest nuclear power generating capacities are the United States (101 335 MW), France (63 130 MW), Japan (44 396 MW), Russia (24 164 MW), South Korea (20 787 MW), China (13 955 MW), Canada (13 531 MW), Ukraine (13 168 MW), Germany (12 113 MW) and United Kingdom (10 0038 MW) (WNA, 2013b). There is minimal growth in nuclear generation capacity in the major developed countries, with most anticipated growth emanating from countries in the East (WNA, 2013b), for example China (200 reactors either under construction, planned or proposed) and India (64 reactors under construction, planned and proposed). Today, the world produces as much electricity from nuclear energy as it did from all sources combined in 1960, see also Figure 4.1 (WNA, 2013a).



**Figure 4.1** Nuclear electricity production and share of total electricity production.

There are at present 435 nuclear reactors in operation across the world (installed capacity of 374 287 MW), with a further 548 either presently under construction, planned or proposed (WNA, 2013b). The required uranium to supply these reactors is estimated at 66 512 t U<sub>3</sub>O<sub>8</sub> per year (WNA, 2013b).

## 4.2 Supply of uranium

Uranium is ubiquitous on the earth and a constituent of most rocks and even of the sea. It is a metal approximately as common as tin or zinc, with some typical concentrations given in Table 4.1 (WNA, 2013c).

**Table 4.1** Typical uranium concentrations.

Location	Concentration ppm U
Very high grade ore - 20% uranium	200 000
High grade ore – 2% uranium	20 000
Low grade ore – 0.1% uranium	1 000
Very low grade ore - 0.01% uranium	100
Granite	3 - 5
Sedimentary rock	2 - 3
Earth's continental crust (average)	2.8
Seawater	0.003

An orebody is, by definition, an occurrence of mineralisation from which a metal is economically recoverable. It is therefore relative to both costs of extraction and market prices. At present, neither the oceans nor any granites are orebodies, but conceivably either could become so if prices were to rise sufficiently. Measured resources of uranium, the amount known to be economically recoverable from orebodies, are thus also relative to costs and prices. They are also dependent on the intensity of past exploration effort. Changes in costs or prices, or further exploration, may alter measured resource figures markedly. At ten times the current price, seawater becomes a potential source of vast amounts of uranium. Thus any predictions of the future availability of any mineral, including uranium, which are based on current cost and price data and current geological knowledge, are likely to be extremely conservative. Table 4.2 gives some idea on the present understanding of uranium resources. (WNA, 2013c)

**Table 4.2** Known recoverable resources of uranium (2011).

Country	Uranium (tonne)	Percentage of world
Australia	1 661 000	31
Kazakhstan	629 000	12
Russia	487 200	9
Canada	468 700	9
Niger	421 000	8
South Africa	279 100	5
Brazil	276 700	5
Namibia	261 000	5
United States	207 400	4
China	166 100	3
Ukraine	119 600	2
Uzbekistan	96 200	2
Mongolia	55 700	1
Jordan	33 800	1
Other	164 000	3
World total	5 327 200	-

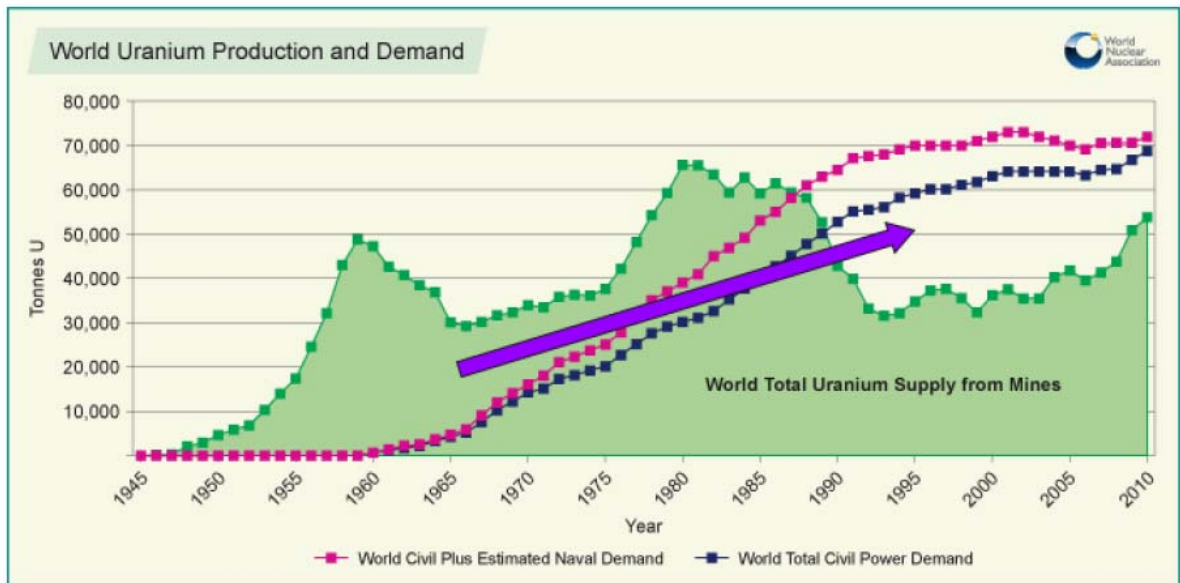
Albeit that present demands for uranium are augmented by nuclear weapons stockpiles (for example, from 2000 the dilution of 30 t of military high-enriched uranium has been displacing about 10 600 t of uranium oxide per year from mines, WNA, 2013c; and overall 500 t of Russian weapons high-enriched uranium will result in about 15 000 t of low-enriched uranium fuel for power reactors, WNA, 2013d), the majority of these demands have to be met by mining. For 2011 the total world production from mining was 54 610 t uranium (64 402 t U<sub>3</sub>O<sub>8</sub>), with Kazakhstan having the largest share of uranium from mines at 36% (of world supply from mines), followed by Canada with 20% and Australia at 17% (WNA, 2013e). During the 1990s the uranium production industry was consolidated by takeovers, mergers and closures, however, this has diversified in recent years with Kazakhstan's diverse ownership structure. In 2011 eight companies marketed 85% of the world's uranium production, as shown in Table 4.3 (WNA, 2013e). The largest producing world uranium mines in 2011 are given in Table 4.4, with the world total uranium supply from mines contrasted against the world civil and estimated naval demand in Figure 4.2 (WNA, 2013e).

**Table 4.3** The eight main uranium mining companies in 2011.

Company	Uranium (tonne)	Percentage
KazAtomProm	8 884	17
Areva	8 790	16
Cameco	8 630	16
ARMZ-Uranium One	7 088	13
Rio Tinto	4 061	8
BHP Billiton	3 353	6
Navoi	3 000	5
Paladin	2 282	4
Other	8 521	15
<b>Total</b>	<b>54 610</b>	<b>100</b>

**Table 4.4** The largest producing uranium mines in 2011.

Mine	Country	Main owner	Type	Production (tonne U)	% of world
McArthur River	Canada	Cameco	underground	7 686	14
Olympic Dam	Australia	BHP Billiton	by-product/ underground	3 353	6
Arlit	Niger	Somair/Areva	open pit	2 726	5
Tortkuduk	Kazakhstan	Katco JV/Areva	<i>in-situ</i> leaching	2 608	5
Ranger	Australia	ERA (Rio Tinto 68%)	open pit	2 240	4
Kraznokamensk	Russia	ARMZ	underground	2 191	4
Budenovskoye 2	Kazakhstan	Karatau JV/Kazatomprom-Uranium One	<i>in-situ</i> leaching	2 175	4
Rössing	Namibia	Rio Tinto (69%)	open pit	1 822	3
Inkai	Kazakhstan	Inkai JV/Cameco	<i>in-situ</i> leaching	1 602	3
South Inkai	Kazakhstan	Betpak Dala JV/Uranium One	<i>in-situ</i> leaching	1 548	3
<b>Top ten total</b>				<b>27 951</b>	<b>52</b>



**Figure 4.2** World total uranium supply from mines contrasted against the world civil and estimated naval demand.

### 4.3 Uranium oxide prices

Uranium oxide prices fluctuate like most commodities, dependent on supply and demand trends. As of 1 April 2013 the weekly spot price is \$ 42.25/lb  $U_3O_8$  (UXCC, 2013a). The price fluctuations for  $U_3O_8$  between 1988 and March 2013 are illustrated in Figure 4.3 (UXCC, 2013b). Financial modelling for the proposed Ongolo project indicates that the project is capable of producing satisfactory returns.



**Figure 4.3** Price fluctuations for  $U_3O_8$  between 1988 and March 2013.

### 4.4 Relevance of economic viability

Uncertainties or substantial fluctuations in production levels, or the actual failure of resource projects, potentially create adverse social and environmental impacts. This is particularly so in the case of large scale projects involving major supporting physical and social infrastructure. Therefore the analysis of the broad economic viability of a project forms a relevant important component of an environmental impact assessment.

In the case of the proposed Ongolo project, assessing economic viability involves consideration of the forecast demand for mined uranium, and its anticipated price relative to the proposed investment in its production. However, for this project fluctuations in the rate of production will have only a minor impact on the socio-economic structure of the region, compared with larger resource projects that involve the establishment of townships and the provisions of a wide range of support services. The proposed project places minimal demands on government services and the interaction with the local community will be relative modest and predominantly beneficial.

#### **4.5 Economic and non-economic benefits and costs**

Social and economic impacts of the proposed Ongolo project will form part of the environmental impact assessment to be undertaken for the project. Naturally new job opportunities will be created at the proposed mine, coupled with economic benefits to the Namibian government and the Swakopmund/Walvis Bay regional community through direct and indirect taxes, and purchases and acquired services in the Swakopmund/Walvis Bay regional area.

Economic costs to the regional community will be minimal, particularly with regard to infrastructure, as dedicated power infrastructure will be developed as part of the proposed project in conjunction with the relevant authorities, water infrastructure for the project will be developed on site, and additional transportation infrastructure costs beyond the Namibian regional road system will be borne by Reptile Uranium Limited.

Significant non-economic benefits can be expected to emanate from increased employment opportunities in skilled and semi-skilled jobs, including the associated training and experience, in the Swakopmund/Walvis Bay regional community, including social upliftment programmes and through an employment multiplier of about 200 percent.



## 5. ALTERNATIVES

### 5.1 Ecologically sustainable development

The goal of ecologically sustainable development (ESD) is to achieve development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (EPA, 1995). The objectives of ESD are to (EPA, 1995):

- enhance the individual and community wellbeing and welfare by following a path of economic development that safeguards the welfare of future generations;
- provide for equity within and between generations; and
- protect biological diversity and maintain essential ecological processes and life support systems.

The challenge for governments and the mining industry is to develop further the mining industry and efficiently manage the renewable and non-renewable resources on which it depends, in accordance with the principles of ESD. Governments are committed to achieving this by pursuing a number of strategic approaches and initiatives to ensure that sound environmental practices are used and promoted throughout all key sectors of the mining industry. (EPA, 1995)

The precautionary principle is a major principle of ESD that underlines Reptile Uranium Namibia's environment protection approach to efficient management of the renewable and non-renewable resources on which it depends. The principle states that (EPA, 1995a:

*where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*

In the application of the precautionary principle, public and private decisions should be guided by (EPA, 1995):

- careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and
- an assessment of the risk-weighted consequences of various options.

The specific designs, approaches and locations used for the proposed development in Section 3, are largely dependent on the physical, biological and social environments impacting on, and being impacted upon, the proposed development. However, ESD principles guided the approaches used to design the Ongolo project's processing facilities, the manner in which mining will proceed and strategies for rehabilitation. These principles are as follows (EPA, 1995):

- adoption of external and internal code of practice, guidelines, standards and principles for exploration, environmental management, rehabilitation and community relations activities;
- comprehensive study, planning, evaluation and development of project proposals;
- extensive consultation with government, landowners and community groups;
- objective and comprehensive environmental impact and risk assessment of projects;
- comprehensive environmental management systems;
- research and development programmes;

- industry environmental review, education and knowledge-sharing networks;
- integration of long-term economic, environmental, social and equity goals in policies, actions and activities;
- ensuring that environmental assets are appropriately valued;
- involving communities in decisions and actions on issues that affect them;
- developing environmentally sound international competitiveness and an economy that can enhance environment protection; and
- recognising the global dimension of the environment and impacts on it.

## 5.2 Assessment of alternatives

In terms of Section 8(g) of the EIA regulations (NGR, 2012b) it is a requirement to provide a description of any feasible and reasonable alternatives that have been identified. Alternatives are different means of meeting the general purpose and need of a proposal (DEAT, 2006) and can be categorised into the following (DEAT, 1998):

- demand alternatives (for example, using energy more efficiently rather than building more generating capacity),
- activity alternatives (for example, providing public transport rather than increasing road capacity),
- location alternatives (for example, either for the entire proposal or for components of the proposal, like the location of a processing plant for a mine),
- process alternatives (for example, the re-use of process water in an industrial plant, waste minimising or energy efficient technology, different mining methods),
- scheduling alternatives (for example, staggering the travelling to and from a plant during off peak times), and
- input alternatives (for example, use of alternative raw materials or energy sources).

The no-go alternative is the option of not undertaking the proposed activity or any of its alternatives. The no-go alternative also provides the baseline against which the impacts of other alternatives should be compared. It should be noted that the no-go alternative may sometimes not be a “real” or “implementable” alternative (for example, where the capacity of a sewage pipeline has to be increased to cope with current demand). It should, however, remain the default option and must always be included to provide the baseline for assessment of the impacts of other alternatives and also to illustrate the implications of not authorising the activity. (DEAT, 2006)

With all the categorised alternatives, the location (site) alternative normally plays the biggest role in assessment of an activity and its related impacts. However, in the case of mining operations the location is seldom available for alternative selection as the proposed mineral for extraction is by its very nature of a particular project exactly at the particular selected site. It is thus imperative that alternatives in some of the other categories be investigated for mining operations, inclusive of alternative extraction methods and relevant processing operations. Scheduling and input alternatives can also be assessed for future benefits to the environment. These alternative options are at present being further evaluated and assessed as part of the overall design of the proposed mining operation.

### 5.3 Consequences of not proceeding

Should the proposed Ongolo project not proceed it will not significantly affect world markets in the longer term (in excess of 20 years), but will certainly benefit Namibia's competitors in the shorter term. The proposed Ongolo development can be economically viable and should be capable of producing U<sub>3</sub>O<sub>8</sub> product at competitive prices.

The construction phase of the proposed Ongolo project will create some 300 to 350 jobs in Namibia. During the actual operational phase, approximately 120 employment opportunities will exist at the mine. Although much of these newly created job opportunities will occur in the mining industry, additional job creation effects will take place in various other sectors as well; for example, personal services, transport and equipment manufacturing. There will be no employment benefit if the mine does not proceed. (Friend *et al.*, 2005)

The proposed Ongolo development will generate new income opportunities for the Namibian government and to the Swakopmund/Walvis Bay regional communities. These income derived sources will include:

- indirect government taxes,
- licence fees and charges,
- pay as you earn (PAYE) taxes, and
- company taxes paid to government.

The proposed development will also contribute to regional development in Namibia, through sourcing of materials, services and labour. Recent estimates indicate that, when fully operational, direct and indirect taxes to the Namibian government will be in the order of N\$ 70 to 100 million per year. This income will be foregone if the mine does not proceed. (Friend *et al.*, 2005)

Purchases and acquired services in the Swakopmund/Walvis Bay regional area, associated with full operation, are estimated to be approximately N\$ 20 million per year, and in the rest of Namibia, approaching N\$ 10 million per year. During the construction phase of approximately 12 months, an estimated N\$ 300 million will be spent on the project, of which at least 30% will be locally sourced. These purchases will not be made if the mine does not proceed. (Friend *et al.*, 2005)

Benefits for not proceeding with the project can be summarised as the following primary benefits:

- the resource will remain in place for possible future development,
- there will be no further visual impact of development,
- there will be no disruption to local communities arising from construction and operation, and
- there will be no alteration to local biodiversity arising from construction and operation.

## 6. DESCRIPTION OF THE ENVIRONMENT

In this part of the scoping report a brief description of the environment that may be affected by the activity is provided in accordance to Section 8(d) of the EIA regulations (NGR, 2012b). Based on the terms of reference developed for this proposed activity in Section 10, detailed information on the affected environment will be accessible after completion of the various aspect and specialist studies.

### 6.1 Climate

#### 6.1.1 Temperature

The Namib Desert near the coast has a temperature range that is moderated by proximity to the sea. As distance increases from the coast the temperature range rapidly becomes more extreme. The hottest month is February, when maximum air temperatures can reach 40°C but the average maximum is 25°C - 30°C. The coldest month is August, when the average minimum temperatures are between 8°C and 12°C depending on distance from the coast. (Christian, 2006)

#### 6.1.2 Precipitation

The average annual rainfall ranges from about 15 mm at the coast to about 35 mm further inland and can best be described as extremely variable, patchy and unreliable. A given location can go for years without any rain. However, the project area receives significant amounts of moisture from fog or dew, particularly near the coast. This fog is sufficient to support at least two species of lichens and many other plants in the project area. (Christian, 2006)

#### 6.1.3 Wind

Near the coast strong southerly winds prevail, but westerly to south westerly winds are also frequent. With increasing distance from the coast the wind speed generally decreases and its direction becomes more variable. Warm easterly winds from the interior blow for typically between 7 and 14 days per year. These "berg winds" are hot dry winds caused by air descending from the interior. As the air descends it is compressed, causing a rapid increase in temperature. These winds can cause serious sandstorms, particularly in winter and spring. (Christian, 2006)

### 6.2 Geology

The central zone of the Neoproterozoic pan-African Damara Orogen is characterised by hundreds of granitoid intrusions and displays a dome and basin structural style (Kinnaird and Nex, 2007). The granites in this zone are classified as syn-, late-, and post-tectonic, whereby the latter include uranium-bearing leucogranites. These leucogranites occur across EPL3496 and form the host rock of uranium mineralisation discovered at the Ongolo site. The leucogranites commonly occur as cross-cutting irregular, anastomosing dykes and concordant bodies following the gneissosity in the Damaran sediments (see Figures 6.1 and 6.2).

RUN identified uranium mineralised leucogranites within the late Proterozoic Khan (MS7) and Chuos formations (Ongolo Main). These units are flanked by thick marble units of the Rössing formation (see Table 2.3, from Nex *et al.*, 2001). The mineralised leucogranites at Ongolo Main and MS7 occur as steeply dipping, sheeted or anastomosing veins adjacent to the marble contact (see Figure 6.3).



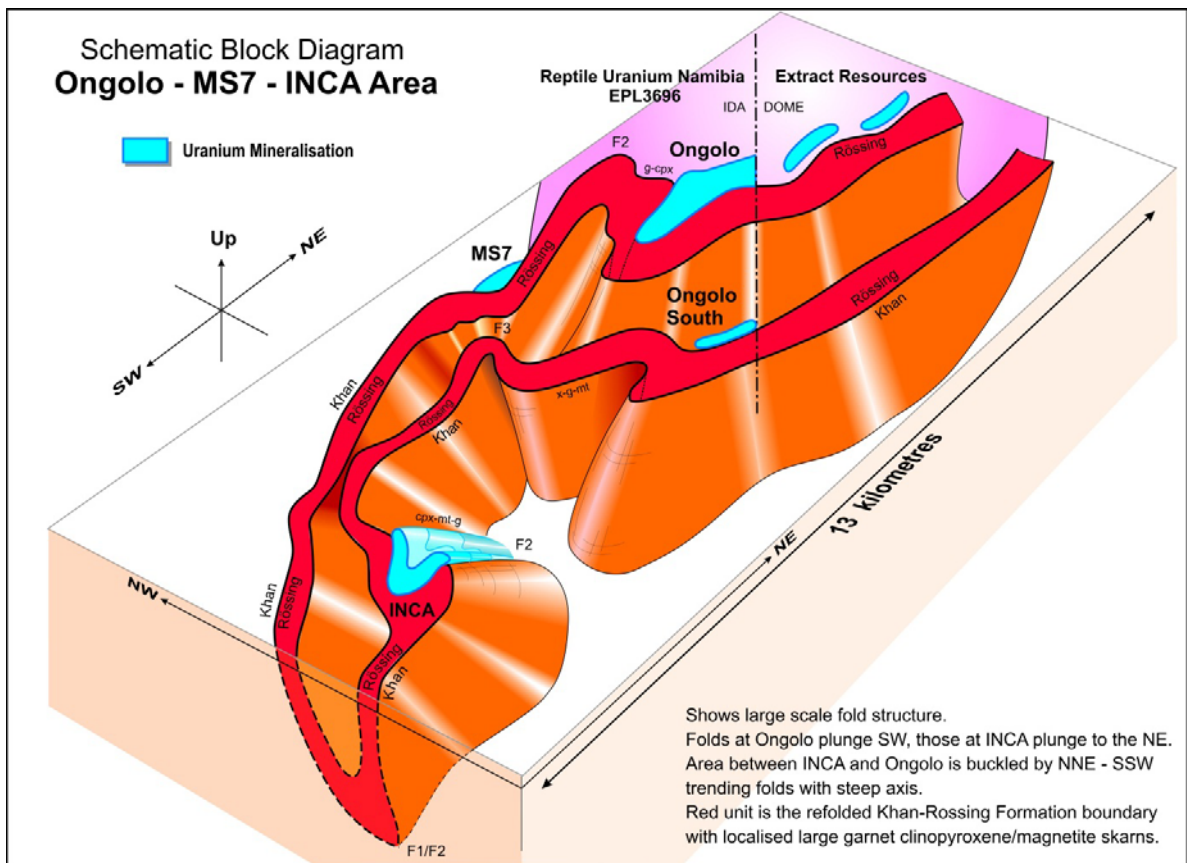
**Figure 6.1** Outcrop of sheeted leucogranite in Khan formation.



**Figure 6.2** Drilling at the Ongolo project with outcrop of Khan formation and leucogranite in the background.

**Table 4.1** Stratigraphy of the Late Proterozoic Damara sequence.

Group	Formation	Lithology
Swakop	Chuosi	Diamiktite
		Pelitic schist
	Rössing	Quartzite
		Upper pelitic gneiss
		Upper marble
		Lower pelitic gneiss
Nosib	Khan	Amphibolite-biotite schist
		Amphibolite-pyroxene gneiss
		Banded gneiss
		Mottled gneiss
		Biotite gneiss
	Etusis	Psammitic gneiss



**Figure 6.3** Schematic block diagram of the Ongolo project area.

The marble most likely played a mechanically important role by inhibiting leucogranitic magma migration, leading to ponding and increasing the degree of fluid-wallrock interaction at the marble contact. The metasediments of the Khan and Chuosi formations with high quantities of ferric iron and reduced sulphides (pyrite, pyrrhotite and chalcopyrite) may have acted as an effective chemical trap for uranium transported in magmatic fluids. Recognition that the metasediments had a folded boudinage structure prior to leucogranite emplacement may explain the partly strata-bound, yet highly irregular and pod-like nature of the ore bodies (Corvino and Pretorius, 2013 *in procer*).

Uranium mineralisation at Ongolo occurs from 20 m below surface and is at 250 m still open at depth (see Figures 6.4 and 6.5). The deposit underlies a broad, flat, gently sloping sheetwash plain, thinly veneered by gravelly alluvial and aeolian sands. At MS7, located approximately two kilometres west of the Ongolo Main deposit, mineralisation occurs from the surface down to a depth of approximately 300 m.

The primary uranium mineral at Ongolo Main and MS7 is uraninite and its occurrence is often marked by the presence of significant visible smoky quartz and, frequently, biotite. Secondary uranium mineralisation in the form of uranophane has also been identified, particularly within fracture zones of the two deposits (see Figures 6.6 and 6.7).



**Figure 6.4** Ongolo Main (hole ALAD1553) - mineralised leucogranitic dyke within Chuos formation at 114.53 m depth.



**Figure 6.5** Ongolo Main (hole ALAD1557) - mineralised pegmatite within the Chuos formation at 249.70 m depth.



**Figure 6.6** MS7 (hole ALAD1221) - mineralised granite with smoky quartz, biotite flakes and traces of secondary uranium mineralisation at 95.91 m depth.



**Figure 6.7** MS7 (hole ALAD1221) - uranophane in fractures zone at 173.5 m depth.



### 6.3 Topography

The proposed project area is fairly flat, rising from approximately 305 m above sea level in the west to approximately 450 m above sea level in the east. Bedrock outcrop is poor. Vast areas are covered by alluvial and minor aeolian sediments. However, marble units of the Rössing formation form some prominent ridges around Ongolo and MS7. Various schists of the Khan formation intruded by sheeted leucogranites constitute the Zebra Mountains that are located immediately to the north of the Ongolo deposit. A number of modern (ephemeral) watercourses cross the project area from east to west.

### 6.4 Soils

The soils of the Namib Desert are formed by various processes, both mechanical and chemical. Nearer the coast, fog, which contains salts and hydrogen sulphide, intensifies chemical processes and soil genesis. The various types of soils found in the area consists of gypsum soils near the coast; further inland the broken crusts found on the surface are more likely to be calcrete (often covered by a layer of quartz pebbles, which may support lichens) and underlying the grassy plains are hard substrates comprised of coarse sandy material, which is probably stabilised by carbonates but not to the extent that hard crusts are formed. (Christian, 2006)

### 6.5 Natural vegetation

The Central Namib along the west coast of Namibia is contained in the Desert Biome and geographically covers the area between the Kuiseb River in the south and the Huab River in the north. Three major physiographic/vegetation types are distinguished in the Ongolo project area (Van Rooyen, 2013):

- sandy and gravelly plains, with *Welwitschia mirabilis*, *Gomphocarpus filiformis* and *Parkinsonia africana* the diagnostic plant species;
- low hills with *Aloe asperifolia*, *Sarcocaulon marlothii*, *Kleinia longiflora* and *Commiphora saxicola* the prominent species; and
- higher mountainous areas, with *Euphorbia virosa*, *Searsia pyroides* var. *dinteri*, *Commiphora oblancheolata*, *Commiphora saxicola*, *Tetragonia reduplicata* and *Monechma clemoides* the dominant species.

The following plant communities are distinguished on the Ongolo project site (Van Rooyen, 2013):

- *Welwitschia mirabilis* plains (see Figure 6.8),
- *Sporobolus nebulosus* - *Zygophyllum stapffii* plains,
- *Arthroerua leubnitziae* - *Hermbstaedtia spathulifolia* undulating plains (see Figure 6.9),
- *Aloe asperifolia* - *Sarcocaulon marlothii* low ridges (see Figure 6.10),
- *Lithops ruschiorum* - *Kleinia longiflora* ridges,
- *Tetragonia reduplicata* - *Commiphora saxicola* hills/mountains, and
- *Hoodia currorii* - *Commiphora saxicola* dolerite dykes.

A total of 64 plant species was identified during surveys conducted in January 2013 in the Ongolo project area, of which nine were tree and/or shrub species, nine dwarf shrub species, 13 succulent species, 20 forb species, 12 grass species and *Welwitschia mirabilis*. Nine Namibian endemic species were identified on site. (Van Rooyen, 2013)



**Figure 6.8** *Welwitschia mirabilis* plains.



**Figure 6.9** *Arthroerua leubnitziae* - *Hermbstaedtia spathulifolia* undulating plains.



**Figure 6.10** *Aloe asperifolia* - *Sarcocaulon marlothii* low ridges.

## **6.6 Fauna**

The general Swakopmund area is regarded as “low” in overall (all terrestrial species) diversity while the overall terrestrial endemism on the other hand is “moderate to high” (Mendelsohn *et al.* 2002). An estimated (that is, at least) 56 reptile, five amphibian, 53 mammal and 124 bird species (breeding residents) are known to or expected to occur in the general Swakopmund area of which a high proportion are classified as endemic. (Cunningham, 2013)

## **6.7 Archaeological sites**

Archaeological sites are scattered throughout the Namib Desert, and may occur in the project area. These may be associated with places that either provided shelter, water, or stone circles used as hunting blinds by the San people. Once again this can only be determined once a specialist study of the project area has been conducted. (Christian, 2006)

## 7. APPLICABLE LEGISLATION

The management and regulation of mining activities falls within the jurisdiction of the Ministry of Mines and Energy (MME); with environmental regulations guided and implemented by the Directorate of Environmental Affairs (DEA), within the Ministry of Environment and Tourism (MET).

The Ongolo project lies within the existing Namib Naukluft Park. Since establishment of the park, numerous prospecting and mining activities have been conducted within it. Environmentally irresponsible behaviour by some operating companies, resulting in long-lasting damage, has led to the establishment of the Policy for prospecting and mining in protected areas and national monuments in 1999 (the term 'protected areas' includes national parks and game reserves). This policy document outlined the procedures to be followed before government takes a decision if a prospecting or mining activity may commence.

Since then various legislation have been drafted, with some already promulgated and in force. The EIA regulations for environmental impact assessments (NGR, 2012a and NGR, 2012b) have been promulgated on 6 February 2012 and provide the basis of the environmental assessment process followed for the Ongolo project. In addition, any proposed mining project should also have to adhere to the following 13 principles of environmental management (SAIEA, 2003; Friend *et al.*, 2005):

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

The legislation of the Namibian government that have been considered in the preparation of the scoping report, in terms of Section 8(e) of the EIA regulations (NGR, 2012b), are presented below. (These referenced documents will be included in Reptile Uranium Namibia's legal register and reviewed on a continuous basis to ensure compliance with current legislation and environmental management best practices.)

### ***Constitution of the Republic of Namibia (1990)***

*Administrative body:* various ministries of the Namibian government.

#### *Main objectives*

Article 95 of the Constitution of the Republic of Namibia states that “the State shall actively promote and maintain the welfare of the people by adopting, *inter alia*, policies aimed at ... maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilisation of natural resources on a sustainable basis for the benefit of all Namibians both present and future; in particular the Government shall provide measures against the dumping or recycling of foreign nuclear and toxic waste on Namibian Territory.”

Article 101 further states that the principles embodied within the constitution “shall not of and by themselves be legally enforceable by any court, but shall nevertheless guide the Government in making and applying laws. ... The courts are entitled to have regard to the said principles in interpreting any laws based on them.”

### ***Electricity Act (No 2 of 2000)***

*Administrative body:* Directorate of Energy, Ministry of Mines and Energy.

#### *Main objectives*

The act provides for the establishment and function of the Electricity Control Board. It replaces the Electric Power Proclamation 4 of 1922. The Electricity Regulations (administrative) are contained in Government Gazette 2371.

### ***Environmental Assessment Policy (1995)***

*Administrative body:* Environmental Assessment Unit, Department of Environmental Affairs, Ministry of Environment and Tourism.

#### *Main objectives*

The policy requires that a proponent follows the integrated environmental management procedure set out in the policy. In terms of this, a detailed environmental assessment is required to be submitted to the Ministry of Environment and Tourism (MET) for any mining, mineral extraction and mineral beneficiation activity.

### ***Environmental Investment Fund of Namibia Act (No 13 of 2001)***

*Administrative body:* Directorate of Environmental Affairs, Ministry of Environment and Tourism.

#### *Main objectives*

The act provides for the establishment of the Environmental Investment Fund of Namibia to support sustainable environmental and natural resources management in the country and for a mechanism to turn environmental crimes into positive protection for the environment (SAIEA, 2010). Fines paid in terms of the Environmental Management Act, and money made from the sale of property which is forfeited in connection with such crimes, will be paid into the Environmental Investment Fund (SAIEA, 2010). The money in the fund could be used for (SAIEA, 2010):

- sustainable use and management of natural resources,
- maintenance of the natural resource base and ecological processes,
- maintenance of biological diversity and ecosystems, and
- economic improvements in the use of natural resources for sustainable rural and urban development.

### ***Environmental Management Act (No 7 of 2007)***

*Administrative body:* Directorate of Environmental Affairs, Ministry of Environment and Tourism.

#### *Main objectives*

The act is not yet in force, but it will give legislative effect to the EIA policy, enable the establishment of the Sustainable Development Advisory Council and the appointment of the Environmental Commissioner and environmental officers. It is expected that these institutions will improve the management of impact assessment in Namibia. The act requires government agencies to work with a unity of purpose in ensuring sustainable resource management. Beyond this, it commands developers to gain clearance from the Environmental Commissioner (not yet appointed) before proceeding with plans. Criminal penalties for violating the conditions of a granted environmental clearance are stiff. (SAIEA, 2010)

### ***Forest Act (No 12 of 2001)***

*Administrative body:* Ministry of Agriculture, Water and Forestry.

#### *Main objectives*

The act makes provision for the declaration of protected areas for the purposes of soil protection, water resources protection, protection of plants and other elements of biological diversity. The Minister may also declare any plant or species of any plant a protected plant and impose conditions under which it shall be conserved, cultivated, used or destroyed by any person. The act further requires a permit before clearing any living vegetation within 100 metres of a river or stream. (SAIEA, 2010)

### ***Labour Act (No 6 of 1992)***

*Administrative body:* Ministry of Labour.

#### *Main objectives*

The act regulates the conditions of employees and addresses:

- unfair dismissals and disciplinary actions;
- termination of contracts of employment;
- registration, rights and duties of trade unions and employers' organisations;
- settlement of disputes between employees or trade unions and employers or employers' organisations;
- appointments, powers, duties and functions of the Labour Commissioner and inspectors;
- the establishment of a Labour Advisory Council, a Labour Court, district labour courts and a Wages Commission; and
- the health, safety and welfare of employees.

A number of regulations have been gazetted since 1992, dealing with various aspects related to employer and employees rights, including the Regulations relating to the health and safety of employees at work, promulgated in terms of the Labour Act (Government Gazette 1617 of 1 August 1997). The administration of these regulations is assigned to various ministers by Proclamation 10/1997, as published in Government Gazette 1615.

### ***Minerals (Prospecting and Mining) Act (No 33 of 1992)***

*Administrative body:* Department of Mines, Ministry of Mines and Energy.

#### *Main objectives*

This act regulates reconnaissance, prospecting and mining of minerals. Various licence types, and their implications, are stipulated. The act details reporting requirements for monitoring of activities and compliance to environmental performance, such as disposal methods. The Mining Commissioner, appointed by the Minister, is responsible for implementing these regulations. A Mineral Board has also been established, the functions of which are to advise the Minister and cooperate with other ministries.

Several explicit references to the environment and its protection are contained in the act, which provides for environmental impact assessments, rehabilitation of prospecting and mining areas and minimising or preventing pollution.

Section 91(f) requires that an application for a mining licence contains particulars of:

- the condition of the existing environment;
- an estimate of the impacts and the proposed mitigation measures; and
- details regarding pollution control, waste management, rehabilitation and minimisation of impacts on adjoining land.

### ***Namibian Water Corporation Act (No 12 of 1997)***

*Administrative body:* Ministry of Agriculture, Water and Rural Development.

#### *Main objectives*

The main functions addressed in this act are to:

- establish the Namibian Water Corporation limited;
- regulate its power, duties and functions;
- provide for efficient use and control of water resources; and
- provide for incidental matters.

### ***National Heritage Act (No 27 of 2004)***

*Administrative body:* Ministry of Culture.

#### *Main objectives*

This act provides for the protection and conservation of places and objects of heritage significance. All archaeological and paleontological objects belong to the state and once an artefact or fossil has been discovered, all mining operations must cease, the area must be cordoned off, and the National Heritage Council needs to be notified. A person who removes, demolishes, damages, despoils, develops, alters or excavates, all or any part of a protected place is liable to a fine of up to N\$100,000 or to imprisonment for up to 5 years, or to both the fine and imprisonment. If damage is caused to a heritage place or object as a result of failure to comply with the act, the person responsible must remedy the damage, failing which the Council may itself take the necessary action and recover the cost from that person. (SAIEA, 2010)

### ***Parks and Wildlife Management Bill of 2009***

*Administrative body:* Directorate of Regional Services and Park Management (previously Parks and Wildlife Management), Ministry of Environment and Tourism

#### *Main objectives*

This bill is still in preparation and aims "to provide a legal framework to provide for and promote the maintenance of ecosystems, essential ecological processes and the biological diversity of Namibia, and the utilisation of living natural resources on a sustainable basis for the benefit of Namibians, both present and future, and to promote the mutually beneficial co-existence of humans with wildlife, to give effect to Namibia's obligations under relevant international legal instruments, and to repeal the Nature Conservation Ordinance 4 of 1975." The bill allows the Ministries of Environment and Tourism and Mines and Energy to agree to withdraw certain areas within parks from mining. Apart from these "no go" areas, mining within parks would only be permitted with written authorisation from the Minister of Environment and Tourism. (SAIEA, 2010)

### ***Water Act (No 54 of 1956)***

*Administrative body:* Department of Water Affairs, Ministry of Agriculture, Water and Rural Development.

#### *Main objectives*

This act was inherited from South Africa and will be replaced by the National Water Resources Act (No 24 of 2004). The current act makes provision for a number of functions pertaining to control and use of water resources, water supply and protection of water resources. The Department of Water Affairs is responsible for conservation and utilisation of these resources. A distinction is made between private and public water in terms of ownership, control and use. The act does not recognise the natural environment as a water user, nor does it specifically address environmental sustainability (and is thus considered not consistent with the constitution).

Sections 21 and 22 deals explicitly with the prevention of water pollution.

### ***Water Resources Management Act (No 24 of 2004)***

*Administrative body:* Department of Water Affairs, Ministry of Agriculture, Water and Rural Development.

#### *Main objectives*

The act has been passed and published, but is not yet in force. Once promulgated it will replace the Water Act (No 54 of 1956). The act provides more specific procedures for water abstraction permitting that are much more tailored to Namibia's climate and geohydrology than the Water Act of 1956. (SAIEA, 2010)



## 8. ENVIRONMENTAL EFFECTS AND ASSESSMENT METHODOLOGY

The objective of the assessment of effects (also termed impacts) is to identify and assess all the significant effects (impacts) that may arise from the undertaking of an activity and the findings used to inform the competent authority's decision as to whether the activity should be either authorised, authorised subject to conditions that will mitigate the impacts to within acceptable levels, or should be refused (DEAT, 2006). In this sense impacts are defined by DEAT (2006) as the changes in an environmental parameter that result from undertaking an activity. These changes are the difference between effects on an environmental parameter where the activity is undertaken compared to that where the activity is not undertaken, and occur over a specific period and within a defined area (DEAT, 2006).

### 8.1 Impact types

Different types of impacts may occur from the undertaking of an activity, which may be positive or negative, and can be categorised as being either direct (primary), indirect (secondary) or cumulative impacts. Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (for example, dust generated by blasting operations on the site of the activity).

These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable. However, indirect impacts are induced changes that may occur as a result of the activity (for example, the use of water from a natural source at the activity will reduce the capacity for supply to other users). These types of impacts include all the potential impacts that either do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity. (Jain *et al.*, 1993; Fuggle and Rabie, 1994; DEAT, 2006)

Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (for example, removal of vegetation may cause soil erosion, leading to excessive sediments in a receiving stream, leading to reduced sunlight penetrating the water and thus reducing dissolved oxygen in the water and adversely affecting aquatic life and water quality). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts. (Jain *et al.*, 1993; DEAT, 2006)

### 8.2 Identification of impacts

The identification of the potential impacts of an activity on the environment should include impacts that may occur during the start/construction, operation and decommissioning/rehabilitation phases of an activity (DEAT, 2006). The process of identification and assessment of impacts includes, *inter alia*, the (Jain *et al.*, 1993; DEAT, 2006):

- determination of current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- determination of future changes to the environment that will occur if the proposed activity does not take place;
- understanding of the activity in sufficient detail to understand its consequences; and
- identification of significant impacts that are likely to occur if the activity is undertaken.

### 8.3 Impact mitigation

Once impacts have been identified and predicted for a particular activity, appropriate mitigation measures need to be established (DEAT, 2006). Mitigation measures are the modification of certain activities in such a way as to reduce the impacts on the environment (Jain *et al.*, 1993). The objectives of mitigation are to (DEAT, 2006):

- find more environmentally sound ways of doing things;
- enhance the environmental benefits of a proposed activity;
- avoid, minimise or remedy negative impacts; and
- ensure that residual negative impacts are within acceptable levels.

When mitigation is considered for (certain) impacts, it should be organised in a hierarchy of actions, namely (DEAT, 2006):

- avoid negative impacts as far as possible through the use of preventative measures,
- minimise or reduce negative impacts to “as low as practicable” levels, and
- remedy or compensate for negative residual impacts that are unavoidable and cannot be reduced further.

#### **8.4 Proposed activity environmental impacts**

Certain impacts of the proposed activity on the environment can be identified during this scoping phase. These identified impacts will also provide an indication of the subsequent specialist studies required, as discussed in Section 10 of this report, and are as follows (note that although some mitigation measures are mentioned, more detailed measures will be presented during the environmental assessment phase and in many cases will negate listed impacts):

- possible loss of flora and fauna communities - mining activities will definitely have a negative impact on these environmental aspects; although through either rehabilitation efforts or off-set programmes these effects can be minimised;
- land use capabilities - as described in Section 2.3, at present the site can be suitable for tourism activities, although certain areas can no more be considered a green field based on previous mining and exploration activities;
- noise impacts - based on the type of activity proposed, namely mining, there exist the potential to generate noise in excess of acceptable ambient levels and mitigation measures, both through designed abatement methodologies and operational procedures, would be required to minimise and sometimes negate these impacts;
- air quality - mining operations will impact on this aspect with subsequent cumulative negative impacts on air quality;
- archaeological, heritage and cultural aspects - no immediate impacts are recognised at present, but these can only be confirmed once a specialist study has been completed as envisaged in Section 10.2;
- radiological issues - the type of mine proposed have the potential to contaminate various environmental aspects through ionising radiation, radon gas and other radionuclides; although these effects already exist in this environment due to the natural presence of uranium and its daughter products in the waters and soils;
- sensitive landscapes and visual aspects - within the Namib-Naukluft Park with its scenic beauty any mining operation will impact negatively on this impact, and sense of place (Barnard *et al.*, 2006) issues should play a significant role;
- social environment - additional workforce during construction and operational phases of the proposed project will impact on the present social environment;
- water pollution - possible pollution of ground and surface water should be negated by adherence to present and proposed legislation with regard to water management principles; and
- economic impacts - positive impacts should result for the local community with the generation of more jobs in the area.

## **8.5 Impact assessment methodology**

The concepts for environmental impact assessments in this report will relate to risk assessment (the process whereby certain impacts to the environment are identified), risk valuation (by using a stipulated assessment criteria whereby impacts are given a rating or weighting and obtaining an overall rating or significance of an impact) and risk management (relating directly to applicable mitigation measures to be implemented to manage a risk of an impact in the "best" interest of a society; Shogren, 1990). Such an assessment is also a requirement in terms of Sections 15(2)(e) and 15(2)(g) of the EIA regulations (NGR, 2012b). In addition, the guideline criteria set out in Section 15(2)(h) of the EIA regulations, in conjunction with assessment criteria from DEAT (1998), Friend *et al.* (2005), DEAT (2006) and Friend and Van Rooyen (2009); will be followed in this report and are presented in the following sections.

### **8.5.1 Nature or status of the impact**

An appraisal of the type of effect the activity would have on the affected environment; rated as either positive (beneficial impact on the environment), neutral (no impact on the environment), or negative (adverse impact on and at a cost to the environment).

### **8.5.2 Extent or scale of the impact**

Indicates whether the impact will be either site specific (impacting within the boundaries of the site), local (within an area of 5 km of the site), regional (Namib-Naukluft Park area), on a national scale (Namibia) or across international borders (Southern Africa).

### **8.5.3 Duration of the impact**

Indicates whether the lifetime of the impact will be either short term (0 - 5 years), medium term (5 - 15 years), long term (where the impact will cease after the operational life of the activity, either because of natural process or human intervention), or permanent (where mitigation either by natural process or human intervention will not occur in such a way or in such a time span that the impact can be considered transient).

### **8.5.4 Intensity or magnitude of the impact**

Establishes whether the impact is destructive or benign and is indicated as either low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected), medium (where the affected environment is altered but natural, cultural and social functions and processes continue, albeit in a modified way), high (natural, cultural or social functions or processes are altered to the extent that it will temporarily cease); or very high (natural, cultural or social functions or processes are altered to the extent that it will permanently cease).

### **8.5.5 Probability of the impact**

Describes the likelihood of the impact actually occurring and is indicated as either improbable (the possibility of the impact to materialise is very low, either because of design, historic experience or implementation of adequate corrective actions), probable (there is a distinct possibility that the impact will occur), highly probable (it is most likely that the impact will occur), or definite (the impact will occur regardless of any prevention or corrective actions).

### **8.5.6 Determination of significance**

After assessment of an impact in accordance to the preceding five criteria, the significance of an impact can be determined through a synthesis of the aspects produced in terms of their nature, extent, duration, intensity and probability. In Table 8.1 various ratings are accorded to these criteria. These ratings are now used to calculate a significance (S) rating and are formulated by adding the sum of ratings given to the extent (E), duration (D) and intensity (I) and then multiplying the sum with the probability (P) of an impact as follows:

$$\text{Significance (S)} = (\text{E} + \text{D} + \text{I}) \times \text{P}$$

The resultant ratings are now described as follows (see also Table 8.1):

- S < 25 implies a low impact (meaning this impact would not have a direct influence on the decision to develop in the area),
- S = (25 - 50) implies a medium impact (where the relevant impact could influence the decision to develop in the area unless it is effectively mitigated), and
- S > 50 implies a high impact (this impact must have an influence on the decision process to develop in the area).

**Table 8.1** Ratings used for determining impact significance.

Nature of impact (N)		Extent of impact (E)		Duration of impact (D)	
positive	+	site specific	1	short term	1
neutral	0	local	2	medium term	2
negative	-	regional	3	long term	3
		national	4	permanent	4
		international	5		

Intensity of impact (I)		Probability of impact (P)		Significance of impact (S)	
low	1	improbable	2	low	< 25
medium	2	probable	4	medium	25 - 50
high	3	highly probable	6	high	> 50
very high	4	definite	8		

### 8.5.7 Additional evaluation criteria

Apart from the assessment criteria presented in the preceding sections; impacts will also be evaluated and assessed based on cumulative impacts, relevant reversibility, potential for irreplaceable loss of resources and level of confidence.

Cumulative impacts (see Table 8.2) can arise from one or more activities and can be defined as being either an additive impact, that is where it adds to the impact caused by other similar impacts; or an interactive impact, that is where a cumulative impact is caused by different impacts that combine to form a new impact. Interactive impacts may cause either countervailing (the nett adverse cumulative impact is less than the sum of the individual impacts), or synergistic (the nett adverse cumulative impact is greater than the sum of the individual impacts). (DEAT, 2006)

The reversibility of an impact simply indicates to what degree its influence on the relevant environment can be negated and is presented in Table 8.2. The potential for irreplaceable loss of resources, based on a relevant impact, indicates the degree to which the impact may cause such loss and is presented in Table 8.2.

The level of confidence indicates the level of certainty that specialists have in the accuracy of their predictions with regard to a relevant assessment and its related determined significance. This will be based on any factors that could bring into doubt the accuracy of their relevant predictions, (for example, an investigation undertaken during a non-ideal season, key research data being unavailable) and thus compromise the level of confidence in the assessment of an impact. The levels of confidence used in this report are presented in Table 8.2 and for levels with either a medium or low level applicable, an additional explanation will be provided as to what the relevant impacting factors were.

**Table 8.2** Additional assessment criteria.

Cumulative impacts	
none expected	no
additive	yes
interactive countervailing	int cou
interactive synergistic	int syn

Reversibility of impacts	
complete	yes
intermediate	probably
not possible	no

Potential for resource loss	
will not take place	no
there is a possibility of this happening	probably
this will definitely happen	yes

Level of confidence	
No uncertainty is associated with the prediction of the impact and all necessary information was available.	definite
The prediction was based on virtually all necessary information being available, with the exception of insignificant information that will not materially affect the outcome of the prediction.	high
Although the majority of the necessary information was available, there is some uncertainty associated with the impact predicted.	medium
There is a high degree of uncertainty associated with the impact predicted as certain key information was unavailable at the time of the prediction.	low

### 8.5.8 Impact assessment presentation

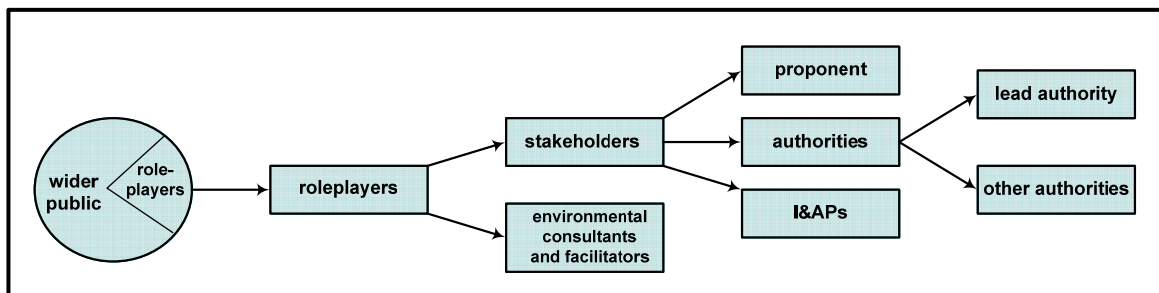
All relevant impacts on the environment are rated and evaluated as set out in the preceding sections and presented via impact tables. It should be noted that impacts are evaluated after mitigation measures, where relevant and indicated as such in the impact tables, have been taken into account. The project impacts are further subdivided into the following three phases\*, from which impacting activities can be identified (DEAT, 1998):

- construction phase – all activities on and off site, including the transport of material,
- operational phase – all activities, including operation and maintenance of structures, and
- decommissioning/rehabilitation phase – any activity related to the physical dismantling of the structures and/or restoring of process/mining land to some degree of its former state.

\* note that while planning and design is recognised as a project phase, it is for this project and generally for most projects, of no negative impact significance.

## 9. PUBLIC PARTICIPATION PROCESS

In terms of Section 8(f) of the EIA regulations (NGR, 2012b), it is a requirement to provide details of the public participation process conducted in accordance with Section 21 of the EIA regulations. Although the term stakeholder engagement is gaining acceptance worldwide as a replacement for the term public participation (DEAT, 2002), this is still the terminology used within the EIA regulations and will be utilised throughout the report where relevant. Clarification of the term public versus stakeholder is provided in Figure 9.1 (DEAT, 2002).



**Figure 9.1** Clarification of the term "public" versus "stakeholder".

Public participation forms an integral part of any present day environmental assessment process. The objectives of public participation can be summarised as follows (Lakhani, 2000):

- informing stakeholders;
- presentation of views, concerns and values;
- maximising benefits and minimising risks;
- influencing project design;
- obtaining local knowledge;
- increasing public confidence;
- better transparency and accountability in decision-making; and
- less conflict (decision-making through consensus).

In order to address these objectives, an information exchange meeting was held with the Ministry of Environment and Tourism (MET) on 30 January 2013 in Windhoek. During this meeting representatives of Reptile Uranium Namibia and Softchem gave presentations of the proposed activity, and obtained feedback and suggestions from representatives of MET present at the meeting. Notification letters and minutes of the 30 January 2013 meeting are presented in Appendix A.

In addition to the above, the various other actions required for public participation, in terms of Section 21 of the EIA regulations, are set out in the following sections.

### 9.1 Notification of potentially interested and affected parties

The requirements for the notification of potentially interested and affected parties of this application are set out in detail in Section 21(2)(b) of the EIA regulations (NGR, 2012b). These requirements have been addressed and include, *inter alia*,

- forwarding letters to the owners and occupiers of land adjacent to the site (see Appendix B for copies of these letters);

- forwarding letters to government authorities (see Appendix B for copies of these letters);
- fixing of a notice board at a place conspicuous to the public; and
- placing of advertisements in at least one local newspaper.

### 9.2 Proof of notice boards and advertisements

Proof of the placement of a notice board is given in Figures 9.2 and 9.3. The advertisements placed in the Namib Times on 8 and 15 March 2013, the Republikein newspaper on 7 and 14 March 2013 and the Namibian newspaper on 8 and 15 March 2013 are shown in Figures 9.4, 9.5 and 9.6 respectively.

### 9.3 Register of interested and affected parties

An interested and affected parties register has been opened, as required in terms of Section 22(1) of the EIA regulations (NGR, 2012b), and the present edition is presented in Appendix C.

### 9.4 Summary of issues raised by interested and affected parties

Apart from various parties forwarding their contact details and information for registration and placement on the IAP register, no other issues have been raised in writing thus far during the public participation process.



Figure 9.2 Placement of notice board at entrance to Ongolo site.



Figure 9.3 Wording on notice board placed at entrance to Ongolo site.



Figure 9.4 Namib Times advertisement of 8 and 15 March 2013.





**Ongolo Project**

Notice is hereby given of the intention of Reptile Uranium Namibia (RUN) to submit an application for a mining licence on EPL3496 in the Namib-Naukluft Park to the competent authorities for the extraction of uranium.

In order to register as an interested and/or affected party (IAP), comment on the proposed activity, and/or to obtain more information on the project, please forward comments and/or registration detail to either Mr Peter Christians at 064415200, or via email to either [info@reptile.com.na](mailto:info@reptile.com.na) or [francois@softchem.co.za](mailto:francois@softchem.co.za).

More information with regard to the project is available from the [www.deeptyellow.com.au](http://www.deeptyellow.com.au) and [www.softchem.co.za](http://www.softchem.co.za) websites.

**Ongolo Projek**

Kennis word hiermee gegee van die voornemens van Reptile Uranium Namibia (RUN) om 'n aansoek in te dien vir 'n mynlisensie op EPL3496 in die Namib-Naukluft Park by die bevoegde gesag vir die ontginning van uraan.

Om te registreer as 'n belanghebbende party, en/of enige kommentaar te lewer oor die projek, en/of meer inligting te bekom, stuur asb. kommentaar en/of registrasie-besonderhede deur aan Mnr Peter Christians te 064415200, of per epos aan [info@reptile.com.na](mailto:info@reptile.com.na) of [francois@softchem.co.za](mailto:francois@softchem.co.za).

Meer inligting aangaande die projek is beskikbaar vanaf die [www.deeptyellow.com.au](http://www.deeptyellow.com.au) en [www.softchem.co.za](http://www.softchem.co.za) webwerwe.

DN/0201300028701

Figure 9.5 Republikein advertisement of 7 and 14 March 2013.



## Ongolo Project

Notice is hereby given of the intention of Reptile Uranium Namibia (RUN) to submit an application for a mining licence on EPL3496 in the Namib-Naukluft Park to the competent authorities for the extraction of uranium.

In order to register as an interested and/or affected party (IAP), comment on the proposed activity, and/or to obtain more information on the project, please forward comments and/or registration detail to either Mr Peter Christians at 064415200, or via email to either [info@reptile.com.na](mailto:info@reptile.com.na) or [francois@softchem.co.za](mailto:francois@softchem.co.za).

More information with regard to the project is available from the [www.deepyellow.com.au](http://www.deepyellow.com.au) and [www.softchem.co.za](http://www.softchem.co.za) websites.

## Ongolo Projek

Kennis word hiermee gegee van die voornemens van Reptile Uranium Namibia (RUN) om 'n aansoek in te dien vir 'n mynlicensie op EPL3496 in die Namib-Naukluft Park by die bevoegde gesag vir die ontginning van uraan.

Om te registreer as 'n belanghebbende party, en/of enige kommentaar te lewer oor die projek, en/of meer inligting te bekom, stuur asb. kommentaar en/of registrasie-besonderhede deur aan Mnr Peter Christians te 064415200, of per epos aan [info@reptile.com.na](mailto:info@reptile.com.na) of [francois@softchem.co.za](mailto:francois@softchem.co.za).

Meer inligting aangaande die projek is beskikbaar vanaf die [www.deepyellow.com.au](http://www.deepyellow.com.au) en [www.softchem.co.za](http://www.softchem.co.za) webwerwe.

Figure 9.6 The Namibian advertisement of 8 and 15 March 2013.

## 10. TERMS OF REFERENCE (PLAN OF STUDY)

It is a requirement in terms of Section 8(i) of the EIA regulations (NGR, 2012b) to include a terms of reference (plan of study) for environmental assessment that sets out the proposed approach to the environmental assessment of the application. The terms of reference relevant to the Ongolo project is presented in the following sections, in accordance with Section 9 of the EIA regulations (NGR, 2012b).

### 10.1 Description of tasks to be undertaken for environmental assessment process

A flow diagram of the environmental assessment process for projects in Namibia was presented in Section 1.3 and can be summarised in Stages A to G as follows:

- Appointment of EAP by the relevant applicant. [A]
- Confirmation of current/correct process to follow for the environmental assessment process through consultation with the competent Namibian authorities (Ministries of Environment and Tourism and Mines and Energy) and handing in of an application for environmental clearance certificate. [B]
- Completion of specialists team selections, initiation of public participation process, meeting with local authorities and scoping report. [C]
- Handing in of scoping report to relevant competent authorities and making available to the public and interested and affected parties in particular. [D]
- Receive comments from interested and affected parties and feedback/decision from competent authority on scoping report; and if scoping report has been accepted; continue with relevant specialist investigations; compilation of draft environmental assessment report and environmental management plan; and public participation process (through open days/meetings). [E]
- Based on specialist investigation reports, interested and affected parties' feedback, the environmental impact assessment report is completed and handed in to the competent authorities. [F]
- Receive feedback/decision from the competent authority with regard the environmental impact assessment report and, as in this particular case, mining licence applications. [G]

### 10.2 Investigations to be completed for environmental impact assessment

Use will be made of specialists to conduct a number of investigations. The various aspects that will be addressed for the environmental assessment to make an objective assessment of the proposed activity and any related alternatives, including the no-go option, are presented in Table 10.1.

### 10.3 Indication of the stages for competent authority consultation

During Stage B for confirmation of administrative detail, Stage C for discussions with local authorities as to the need for the proposal and other suggestions, Stage D during handing in of documentation (if required), Stage E during the authority's feedback (if required), and any other stage if so required by the competent authority.

### 10.4 Description of assessment methodology

The proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity, is set out in Section 8.5 of this report.

### 10.5 Particulars of the public participation process

The public participation process that will be conducted during the environmental assessment process will follow the requirements set out in Section 21 of the EIA regulations, as well as the guidelines published as part of the Integrated Environmental Management Guideline Series (No 7) published on 18 June 2010 (DEA, 2010). These will include, *inter alia*, (DEA, 2010):

- notification of potential interested and affected parties (IAPs) of the proposed activity and the publication of draft reports,
- placement of notice board and advertisements in local and regional newspapers,
- having an open day/meeting for IAPs,
- maintaining an interested and affected parties register, and
- informing IAPs of any new information forthcoming during the environmental impact assessment process.

The public participation process for this proposed activity has already started and was presented in Section 9. At present two open day public participation meetings are planned for 11 June 2013 in Windhoek and 13 June 2013 in Swakopmund.

Aspect	Organisation	Name(s)
climate	Airshed Planning Professionals	Hanlie Liebenberg-Enslin
geology	Reptile Uranium Namibia	Dr Katrin Kärner Klaus Frielingsdorf
topography	Reptile Uranium Namibia	Dr Katrin Kärner Klaus Frielingsdorf
soils	Reptile Uranium Namibia	Peter Christians Klaus Frielingsdorf
land use capabilities	Reptile Uranium Namibia Softchem	Peter Christians Francois Friend
hydrology	Eco Aqua	Mark Stanton
air quality	Airshed Planning Professionals	Hanlie Liebenberg-Enslin
natural vegetation	Ekotrust	Dr Noel van Rooyen
animal life	Environmental and Wildlife Consulting Namibia	Peter Cunningham
invertebrates	University of Pretoria	Dr Dawid Jacobs
archaeological, heritage and cultural aspects	Quaternary Research Services	Dr John Kinahan
sensitive landscapes and visual aspects	Reptile Uranium Namibia Softchem	Peter Christians Francois Friend
noise	National Environmental Health Consultants	Johan Cornelissen
radiation	VO Consulting	Dr Detlof von Oertzen
social and economic environment	Reptile Uranium Namibia Softchem	Peter Christians Francois Friend
occupational health and safety	National Environmental Health Consultants	Johan Cornelissen
process investigation and design	Bateman	Jon Kock

**Table 10.1** Aspects to be addressed during environmental assessment and relevant parties involved in these studies.

## 11. CURRICULUM VITAE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

In terms of Section 8(a) of the EIA regulations (NGR, 2012b) it is a requirement to provide a curriculum vitae of the environmental assessment practitioner (EAP) who prepared the report and the expertise of the EAP to carry out scoping procedures. This is provided in the following sections under general information, experience and related publications.

### 11.1 General information

**Name:** John Francois Curling Friend  
**Education:** BEng (Chem) Pretoria 1986  
MSc (Eng) Cape Town 1991  
Dip MktM IMM 1995  
**Affiliations:** FSAIChE (Fellow, South African Institution of Chemical Engineers)  
FIChemE (Fellow, United Kingdom Institution of Chemical Engineers)  
FWISA (Fellow, Water Institute of South Africa)  
FIWM(SA) (Fellow, Institute of Waste Management of Southern Africa)  
**Registrations:** PrEng (Professional Engineer, Engineering Council of South Africa)  
CEng (Chartered Engineer, United Kingdom Engineering Council)  
**Specialisation:** Water management, treatment and recycling. Air quality and waste management. Environmental management, economics, assessments and auditing. Technical audits and effluent treatment. Specialised computer applications.

### 11.2 Experience

#### 1991 - Present

Softchem, founder member. Waste management (Eloptro and Markert Engineering in Germany), water management and treatment (Degrémont, Eskom, Eurocoal, Gold Fields, Impala Platinum, Omnia Fertilizer, SAB and Sasol Mining), water treatment dedicated software (Anglo American Research Laboratories, Eskom, Omnia Fertilizer and Veolia Eau in France), functional specifications and operating manuals for water treatment plants (Saldanha Steel as subcontractor to DB Thermal), technical and environmental auditing (Eskom), environmental impact assessments (including public participation meetings) and evaluations (ABI/Coca-Cola, Deep Yellow Limited/Reptile Uranium Namibia, Envitech/Waste Giant, Gautrans, Necsa and Paladin Resources/Langer Heinrich Uranium), environmental management programme report (Eurocoal), environmental consulting (Eurocoal) and ISO 14001 environmental system implementation (Eskom, Midvaal Water Company and Vametco Alloys).

#### 2005 - Present

SI Analytics (Pty) Ltd., Director Operations and Projects. Supplying air monitoring equipment to industry and government.

#### 1997 - Present

Waterops (Pty) Ltd., Director: Operations and Marketing. Water treatment plant operations and troubleshooting.

#### 1998 - 2007

University of Pretoria, Department of Chemical Engineering, Senior Lecturer. Responsible for the Environmental Engineering Group lecturing environmental engineering and postgraduate courses in environmental management, air quality management, waste management, air pollution control and water management.

#### 1992 - 1998

Eskom Technical Audit Division, Chief Consultant (Water Management). Project leader for a variety of multi disciplinary audit projects. Environmental management and audits. Water management and treatment. SAATCA registered lead auditor. Chairman Eskom Waste Management Forum. International exposure in water treatment and flue gas desulphurisation through extended overseas visits to Japan, USA, United Kingdom, France and Germany.

#### 1990 - 1992

Eskom Chemical Engineering Division, Design Engineer. Water management studies at numerous power stations and external to Eskom, eg Soda Ash Botswana. Effluent treatment plant design.

### 1988 - 1990

Koeberg Nuclear Power Station, Engineer in Training. Water treatment plant operation and troubleshooting, sodium hypochlorite production, sewage treatment and water chlorination plants, ion exchange resins.

### 1985 - 1986

Eskom Chemical Engineering and Chemistry Division, Engineering Assistant. Air pollution, flue gas desulphurisation processes, boiler acid cleaning. (National military service: 1986 - 1988).

## 11.3 Related publications\*

**BARNARD D, BARNARD C, FRIEND JFC and VISSER D (2003)** *Roadmap to environmental legislation*. Impact Books, Pretoria, South Africa. ISBN 0-620-31028-6.

**BARNARD D, BARNARD C, FRIEND JFC and VISSER D (2005)** *Roadmap to environmental legislation - Edition 2*. Impact Books, Pretoria, South Africa. ISBN 0-620-31028-6.

**BARNARD D, FRIEND JFC, BARNARD C and VISSER D (2006)** *Roadmap to environmental legislation - Edition 3*. Impact Books, Pretoria, South Africa. ISBN 0-620-37673-2.

**CAWOOD BL and FRIEND JFC (2005)** Evaluation of 38 years of radiological environmental data for the nuclear research facility in South Africa. *Journal of Environmental Radioactivity*, **79**, 255 - 271.

**DE BEER PJ and FRIEND JFC (2006)** Environmental accounting: a management tool for enhancing corporate environmental and economic performance. *Ecological Economics*, **58**, 548 - 560.

**FRIEND JFC (1993)** *Management in a changing environmental sphere*. Technology Leadership Programme dissertation, Eskom, Johannesburg, South Africa.

**FRIEND JFC (1996)** Formulating and developing an environmental auditing system to add value to your business. Paper presented at the *Industrial Waste Management Solutions - 6th Annual Waste Management symposium*, 22 - 23 January 1996, Johannesburg, South Africa.

**FRIEND JFC (1996)** A practical guide to conducting environmental audits. Paper presented at the *Environmental Systems Standards and Auditing conference*, 20 - 21 May 1996, Johannesburg, South Africa.

**FRIEND JFC (1997)** Environmental audit - process and methodology. Paper presented at the *Conducting and Managing Environmental Audits conference*, 23 - 24 October 1997, Johannesburg, South Africa.

**FRIEND JFC (2001)** Possible solutions to the challenges facing environmental management in a first/third world developing country. Paper presented at the *6th World Congress of Chemical Engineering*, 23 - 27 September 2001, Melbourne, Australia. [Conference proceedings ISBN 0 7340 2201 8.]

**FRIEND JFC (2003)** The Blue Model, education and effective environmental management in South Africa. Paper presented at the *Building Capacity for Impact Assessment, 23rd International Association for Impact Assessment (IAIA) conference*, 17 - 20 June 2003, Marrakech, Morocco.

**FRIEND JFC (2003)** Water balances - an essential environmental tool for power stations. Paper presented at the *CHEMECA 2003, 31st Australasian Chemical Engineering conference*, 28 September - 1 October 2003, Adelaide, Australia. [Conference proceedings ISBN 0 86396 829 5.]

**FRIEND JFC (2003)** *Environmental management in South Africa: the Blue Model*. Impact Books, Pretoria, South Africa. ISBN 0-620-31258-0.

**FRIEND JFC (2004)** Practical implementation of environmental legislation in a first/third world country. Paper presented at the *24th International Association for Impact Assessment (IAIA) conference*, 24 - 30 April 2004, Vancouver, Canada.

**FRIEND JFC (2005)** Assessment criteria for determining environmental impact significance ratings. Paper presented at the *25th International Association for Impact Assessment (IAIA) conference*, 31 May - 3 June 2005, Boston, United States of America.

**FRIEND JFC (2005)** Selected studies for the proposed establishment of the Zone of Integration residential township. *Softchem confidential report*, No KWPREP/2005/01, December 2005, Johannesburg, South Africa.

**FRIEND JFC (2008)** Environmental and Process Solutions third party hazard classification for Lanxness feasibility study. *Softchem confidential report*, No EPSREP/2008/01, April 2008, Johannesburg, South Africa.

**FRIEND JFC (2011)** Water management and grey water legislation in South Africa. *Softchem information report*, No PUREP/2011/01, 16 May 2011, Johannesburg, South Africa.

**FRIEND JFC (2012)** Omnia Fertilizer North Factory Sasolburg water management report. *Softchem confidential report*, No OMREP/2012/03, 25 September 2012, Johannesburg, South Africa.

- FRIEND JFC (2013)** Impala Platinum evaluation of water treatment options at Impala Rustenburg. *Softchem confidential report*, No IMREP/2013/01, 25 January 2013, Johannesburg, South Africa.
- FRIEND JFC, BORSHOFF J, PRETORIUS LE, MARSH D, SIEBERT T, SLABBERT J, VAN ROOYEN N, DU TOIT L, KVASNICKA J, SPEISER A, KINAHAN J, POTGIETER F, BUTCHER D and VAN RENSBURG J (2004)** Langer Heinrich Uranium Mine environmental assessment draft report. *Softchem report*, No LHUEA2004.01, October 2004, Johannesburg, South Africa.
- FRIEND JFC, BORSHOFF J, PRETORIUS LE, MARSH D, SIEBERT T, SLABBERT J, VAN ROOYEN N, DU TOIT L, KVASNICKA J, SPEISER A, KINAHAN J, POTGIETER F, BUTCHER D and VAN RENSBURG J (2005)** Langer Heinrich Uranium Mine environmental assessment final report. *Softchem report*, No LHUEA2005.01, April 2005, Johannesburg, South Africa.
- FRIEND JFC, JEWASKIEWITZ S and DE JAGER E (2010)** Final scoping report for the Vlakfontein waste treatment facility. *Softchem public access report*, No WGSCOREP/2010/02, 7 December 2010, Johannesburg, South Africa.
- FRIEND JFC, NELL LR, GOOSEN AJ and CONLIN JB (1997)** An environmental assessment of water management at Eskom coal fired power stations. Paper presented at the *Power Plant and Environment 1997 VGB conference*, 16 - 17 April 1997, Düsseldorf, Germany.
- FRIEND JFC, NELL LR, GOOSEN AJ and CONLIN JB (1998)** An environmental assessment of water management at Eskom coal fired power stations. *VGB PowerTech*, 78(9), 71 - 74.
- FRIEND JFC, PRETORIUS LE, FRIELINGS DORF K, VERSTER J and DE JAGER C (2010)** Scoping report for the Omahola project. *Softchem public access report*, No RUNSCOREP/2010/01, 11 October 2010, Johannesburg, South Africa.
- FRIEND JFC and VAN ROOYEN N (2009)** Environmental risk analysis for the NECSA proposed water and effluent infrastructure upgrade. *Softchem public access report*, No EIMSREP/2009/01/R4, June 2009, Johannesburg, South Africa.
- FRIEND JFC, VAN ROOYEN N, JEWASKIEWITZ S and DE JAGER E (2011)** Environmental impact assessment report for the Vlakfontein waste treatment facility. *Softchem public access report*, No WGEIAREP/2011/01, 17 August 2011, Johannesburg, South Africa.
- FRIEND JFC, VAN ROOYEN N, KHUMALO L, LIEBENBERG-ENSLIN H, KINAHAN J, CUNNINGHAM P, PRETORIUS LE, FRIELINGS DORF K, MESSIDAT W, VAN NIEKERK P, STANTON M, CORNELISSEN J, IRISH J and SCHOLTZ R (2011)** Environmental impact assessment report for the Shiyela iron project. *Softchem public access report*, No SHIEIAREP/2011/01, 5 October 2011, Johannesburg, South Africa.
- FRIEND JFC, VAN ROOYEN N, KHUMALO L, LIEBENBERG-ENSLIN H, KINAHAN J, CUNNINGHAM P, PRETORIUS LE, FRIELINGS DORF K, MESSIDAT W, VAN NIEKERK P, STANTON M, CORNELISSEN J, IRISH J, SCHOLTZ R and VON OERTZEN D (2011)** Environmental impact assessment report for the INCA project. *Softchem public access report*, No INCEIAREP/2011/01, 5 October 2011, Johannesburg, South Africa.
- FRIEND JFC, VAN ROOYEN N, KHUMALO L, LIEBENBERG-ENSLIN H, KINAHAN J, CUNNINGHAM P, PRETORIUS LE, FRIELINGS DORF K, MESSIDAT W, VAN NIEKERK P, STANTON M, CORNELISSEN J, IRISH J, SCHOLTZ R and VON OERTZEN D (2011)** Environmental impact assessment report for the Tubas project. *Softchem public access report*, No TUBEIAREP/2011/01, 5 October 2011, Johannesburg, South Africa.
- FRIEND JFC and VAN TONDER H (2007)** GAUTRANS basic assessment report for upgrading of Lynnwood Road. *Gauteng Department of Agriculture, Conservation and Environment public access report*, No GAUT 002/07 - 08/N0242, August 2007, Johannesburg, South Africa.
- FRIEND JFC, VENTER C, POTGIETER F and McGEE D (2003)** NECSA Pelindaba evaluation of the environmental monitoring programme report. *Softchem confidential report*, No NECSA/REP/2003/03, July 2003, Johannesburg, South Africa.
- HATTINGH J and FRIEND JFC (2003)** Environmental and economic implications of slag disposal practices by the ferrochromium industry: A case study. *Water SA*, 29(1), January 2003, 23 - 30.
- MILLS JE, HANSEN AD and FRIEND JFC (2009)** Monitoring black carbon, its role in climate change and air pollution. Paper presented at the *National Association for Clean Air (NACA) conference*, 14 - 16 October 2009, Vanderbijlpark, South Africa.
- PRINSLOO NP and FRIEND JFC (2010)** Vale Mozambique ambient air quality monitors microscale siting report. *SI Analytics confidential report*, Nos VALEREP/2010/01, 8 October 2010, Johannesburg, South Africa.
- PRINSLOO NP, WRAY C and FRIEND JFC (2010)** Air quality impact assessment for the Vlakfontein waste treatment facility. *Softchem public access report*, No WGAIMREP/2010/01, 24 November 2010, Johannesburg, South Africa.

\* additional publications available from the website [www.softchem.co.za](http://www.softchem.co.za).

## 12. DRAFT ENVIRONMENTAL MANAGEMENT PLAN

In terms of Section 8(j) of the EIA regulations (NGR, 2012b) it is a requirement to complete a draft environmental management plan containing the aspects contemplated in Sections 8(j)(aa) to (cc) of the EIA regulations. This is best utilised and formerly developed by the implementation of an environmental management system.

### 12.1 Environmental management system

RUN will strive to align its environmental management system (EMS) in accordance with the ISO 14001:2004 standard (even if not accredited under the standard). ISO 14001 is the world's most recognised EMS framework, enabling organisations to demonstrate sound environmental management by minimising harmful effects on the environment and achieving continual improvement through a formal environmental management system, which is subject to external audit verification.

### 12.2 Development of the environmental management system

In order to address all relevant environmental impacts and to assist in the development of a practical environmental management plan, RUN will implement the following four level documented environmental management system:

*Level 1* - this level of documentation will consist of the company's environmental policy and the environmental management system manual (roadmap to the complete EMS);

*Level 2* - environmental specific and company related documentation;

*Level 3* - environmental and related registers and activity specific work instructions; and

*Level 4* - records (for example, analyses and monthend reports) and related documentation (for example, feedback reports to authorities, management reviews and audit reports).

The following four EMS procedures will be developed, approved, authorised and implemented at the proposed mining site (ISO 14001, 2004):

- *Environmental policy and management review procedure;*
- *Environmental management system planning procedure* (addressing environmental aspects; legal and other requirements; and objectives, targets and programmes);
- *Environmental management system implementation and operation procedure* (addressing resources, roles, responsibility and authority; competency, training and awareness; communication; documentation; control of documents; operational control; and emergency preparedness and response); and
- *Environmental management system checking procedure* (addressing monitoring and measurement; evaluation of compliance; nonconformity, corrective and preventive action; control of records; and internal audit).

The following Level 3 documents are, *inter alia*, envisaged for the proposed mining site, for ISO 14001 alignment:

- environmental aspects and impacts register,
- environmental legal register,
- environmental objectives, targets and programme,
- environmental training register,
- environmental complaints register, and
- EMS audit schedule.



The company will strive to have the proposed environmental management system, with related documentation and practical requirements, implemented during/prior to the construction phase of the proposed project.

### **12.3 Development of the draft environmental management plan**

The environmental impacts identified in Section 8, proposed measures for mitigation of these impacts, monitoring actions and methods required for implementation of these mitigated measures, responsibilities and resources required for implementation form the basis of compiling a suitable draft environmental management plan in terms of the requirements stipulated by Section 8(j) of the EIA regulations. The required draft environmental management plan is set out in Appendix D.

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