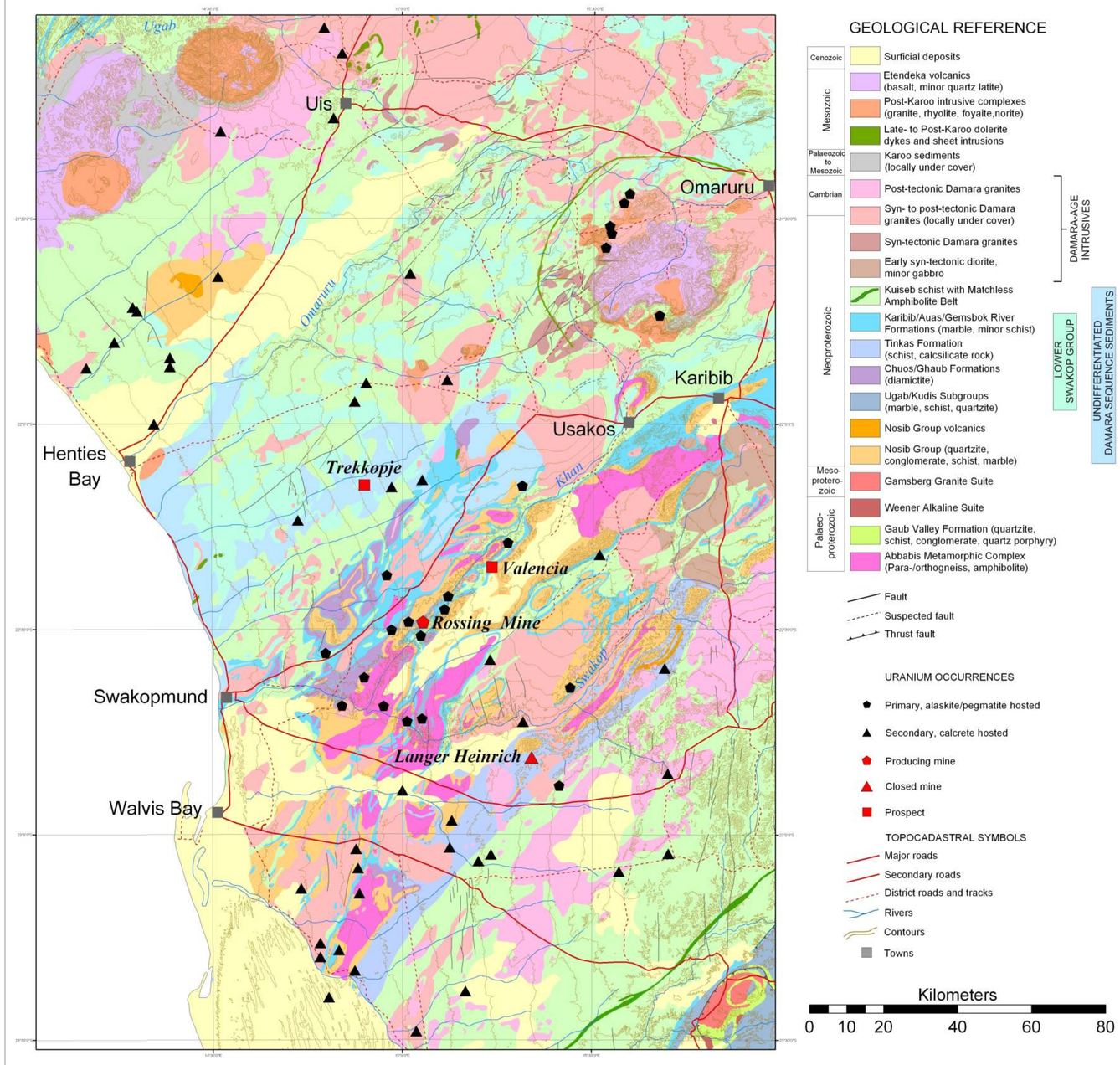
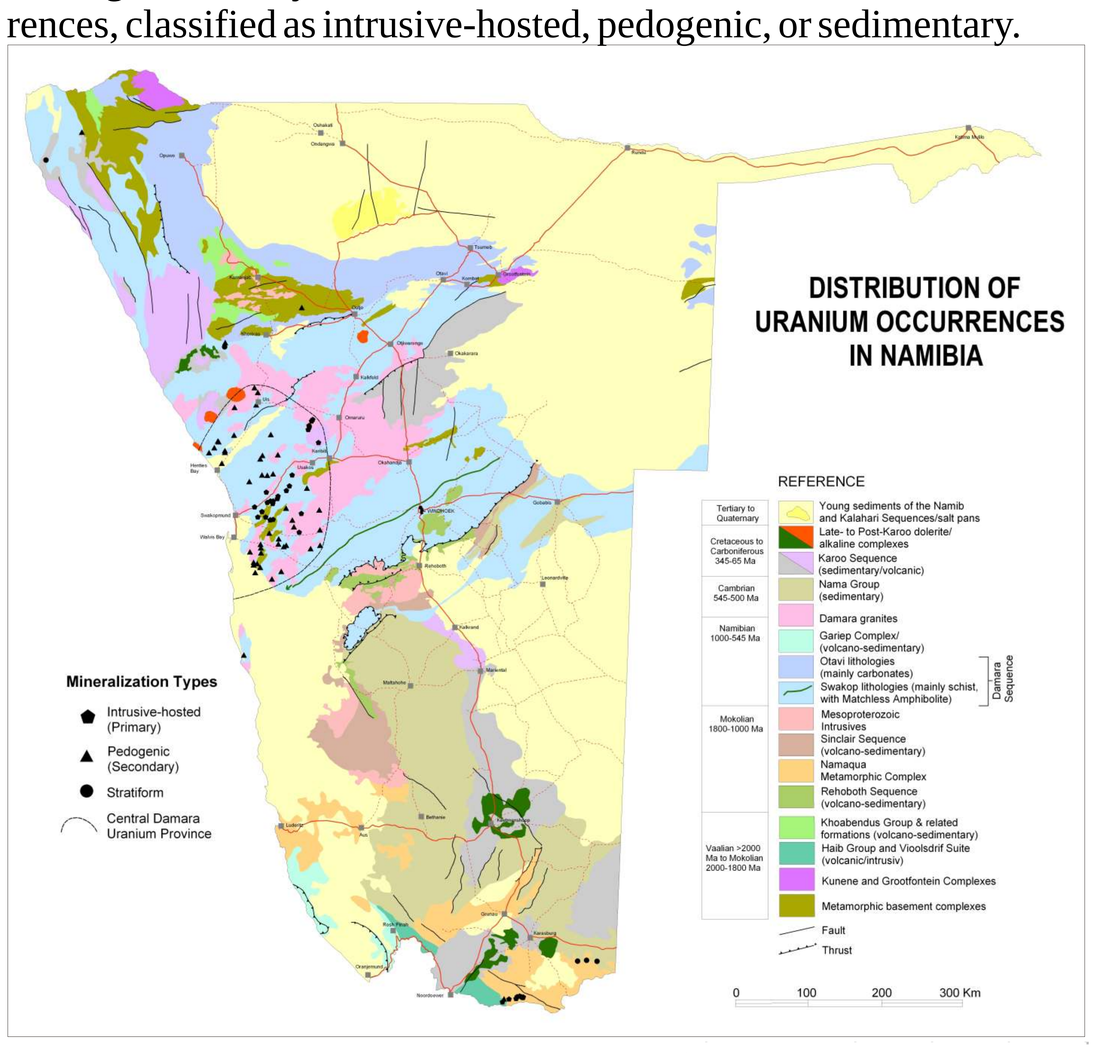
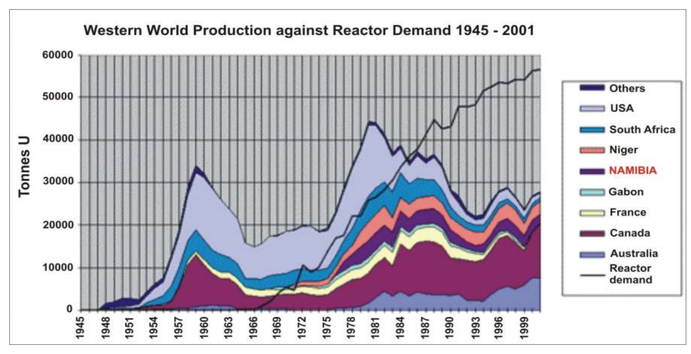
URANIUM MINERALISATION IN NAMIBIA

CENTRAL DAMARA URANIUM PROVINCE



Although the western central Damara Belt hosts Namibia's best-known deposits (e.g. Rossing, Langer Heinrich, Valencia), uranium has also been found in the north (Engo Valley) and in the south (Namaqua Belt). Airborne radiometric surveys conducted by the Geological Survey in the 1970s located a number of new occurrences, classified as intrusive-hosted, pedogenic, or sedimentary.

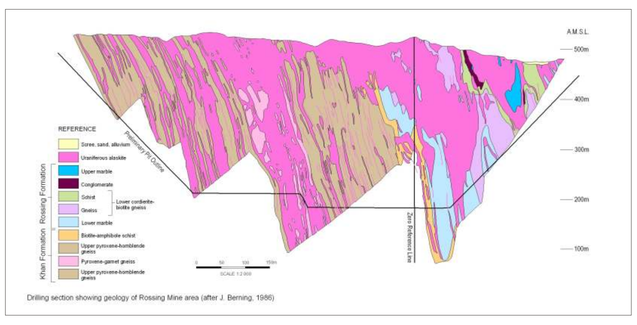




Production from mines (tonnes U)

Country	2003	2004	2005
Canada	10457	11597	11628
Australia	7572	8982	9519
Kazakhstan	3300	3719	4357
Russia (est)	3150	3200	3431
Namibia	**2036**	**3038**	**3147**
Niger	3143	3282	3093
Uzbekistan	1598	2016	2300
USA	779	846	1039
Ukraine (est)	800	800	800
China (est)	750	750	750
South Africa	758	755	674
Czech Repub.	452	412	408
India (est)	230	230	230
Romania (est)	90	90	90
Germany	150	150	77
Pakistan (est)	45	45	45
France	0	7	7
Brazil	310	300	0
Total world	**35613**	**40219**	**41595**

ROSSING MINE



Drilling section showing geology of Rossing Mine area (after J. Berning, 1986)

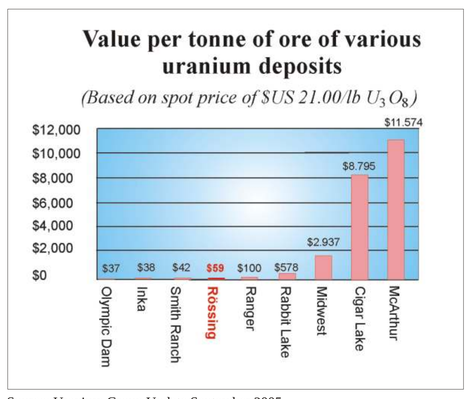
Rössing uranium mine is located some 70 km northeast of Swakopmund in the Namib Desert. The uranium-bearing alaskite occurs in deformed metasedimentary rocks of the Damara Belt, along the northern limb of a complex synclinorium, and ranges from small quartzo-feldspathic lenses of secretion origin to large intrusive and replacement bodies with variable uranium content. To control grade radiometric scanners determine the radioactivity level of each truck load of ore.

About 55% of the uranium is contained in Uraninite [UO_2], less than 5% in betafite [$(U,Ca,Ce)(Ti,Fe)_2O_6$], and about 40% in secondary minerals, among which beta-uranophane [$Ca(UO_2)Si_2O_7.6H_2O$] is the most abundant. The average grade of the ore, which is mined in an opencast operation, is 0.3kg/t, and the uranium is recovered by means of conventional metallurgical processes. Commercial production started in January 1978; the expected output for 2005 was 3,800 t of U_3O_8.

The largest-producing uranium mines in 2005 were:

Mine	Country	Main owner	Type	Production (tU)	% of World
McArthur River	Canada	Cameco	Underground	7200	17.3
Ranger	Australia	ERA (Rio Tinto 68%)	Open pit	5006	12.0
Olympic Dam	Australia	BHP Billiton	By-product/under-ground	3688	8.9
Rossing	**Namibia**	**Rio Tinto (69%)**	**Open pit**	**3147**	**7.6**
Krabokamensk	Russia	TVEL	Underground	ca. 3000	7.5
Rabbit Lake	Canada	Cameco	Underground	2316	5.5
McLean Lake	Canada	Cogema	Open pit	2112	5.1
Akouta	Niger	Areva/Onarem	Underground	1778	4.3
Arlit	Niger	Areva/Onarem	Open pit	1315	3.2
Beverly	Australia	Heathgate	ISL	825	2.0
Top Ten Total				30,382	73.1

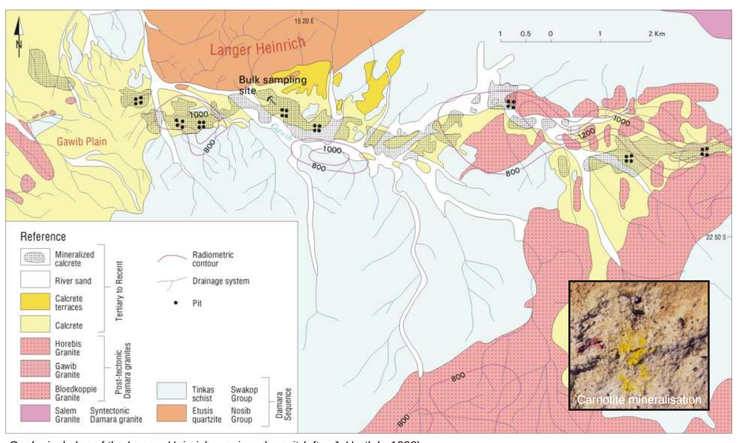
Source: World Nuclear Association



Source: Uranium Group Update September 2005

Although Rössing ranked 4th in world uranium production in 2004, the ore grade is low compared to other major uranium mines.

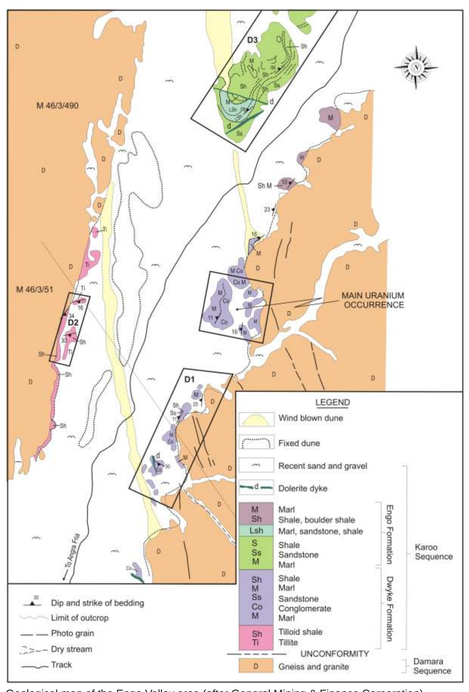
LANGER HEINRICH



Geological plan of the Langer Heinrich uranium deposit (after J. Hartleb, 1988)

The Langer Heinrich deposit is situated in a river valley, 90 km east of Swakopmund, which is a portion of a 13 km - long E - W trending palaeochannel, transecting the Bloedkoppie Granite (up to 100 g/t U_3O_8) in the east and Damara schist in the west. The northern bank of the palaeochannel consists of Nosib quartzite.

The mineralisation, which is hosted by fluvial sediments of the palaeochannel, occurs in thin tabular bodies throughout the sedimentary rocks. Carnotite [$K(UO_2)(VO_4).1½H_2$] is irregularly distributed as small patches and lenses around pebbles and in cracks, or finely disseminated in the host rock. It extends westwards across the Gawib River and continues under young sediment cover for ca. 2.5 km. With a 250 ppm U_3O_8 cut-off, total resources are 72.3 Mt at 600-700 ppm U_3O_8, containing 44,000t U_3O_8. After completion of the development phase production will start in 2006.

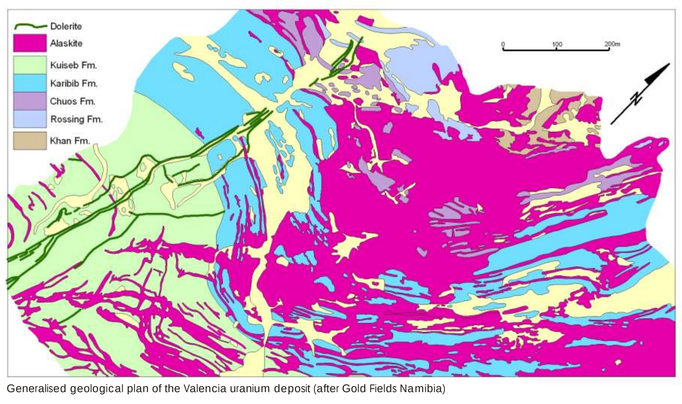


Geological map of the Engo Valley area (after General Mining & Finance Corporation)

Engo Valley

Disconformity-type uranium mineralisation (carnotite) occurs in fluvio-glacial alluvial fan-type deposits of the Karoo-age Dwyka Formation, and within shales of the overlying Ecca Group (very fine-grained uraninite associated with pyrite and chalcopyrite), in the Engo river valley of northwestern Namibia. Large post-tectonic granite intrusions related to the Damara Orogeny are thought to be the source of the uranium mineralisation. Ore resources calculated for two mineralised zones are 5.68 million t at 340 g/t, but grade within these zones varies greatly over short distances (Fletcher, 1981).

VALENCIA



Generalised geological plan of the Valencia uranium deposit (after Gold Fields Namibia)

The Valencia deposit is hosted by metasedimentary rocks of the Damara Sequence. Uraniferous alaskite is emplaced on the northwestern limb of a recumbent synclinorium cored by metamorphic basement, where it forms massive stock-like bodies, dykes of variable thickness, and conformable as well as transgressive veins, possibly representing syntectonic and post-tectonic phases of intrusion. The alaskites, which contain abundant host-rock xenoliths, vary from aplitic to pegmatitic, with uranium mineralisation generally being better developed in the finer-grained rocks.

The secondary uranium minerals uranophane [$Ca(UO_2)2Si_2O_7.H_2O$] and uranothallite [$Ca_2U(CO_3)_4.10H_2O$] are present in the upper few metres of the alaskite bodies as yellow coatings on exfoliation planes and joints; uraninite is usually fresh, with only sporadic alteration rims. The uranium is variably distributed throughout the alaskite, and locally high-grade ore is in contact with barren or poorly mineralised metamorphic host-rock. Enriched zones are commonly found on or near contact with country rock xenoliths, and the degree of darkness of the quartz is indicative of the relative uranium content. A feasibility study was completed in 1989, when total resources were estimated at 42.7 million tonnes of ore with an average grade of 0.214 kg/t U_3O_8 to a depth of 210 metres. A re-evaluation of the deposit is currently under way.

Compiled by U. Schreiber