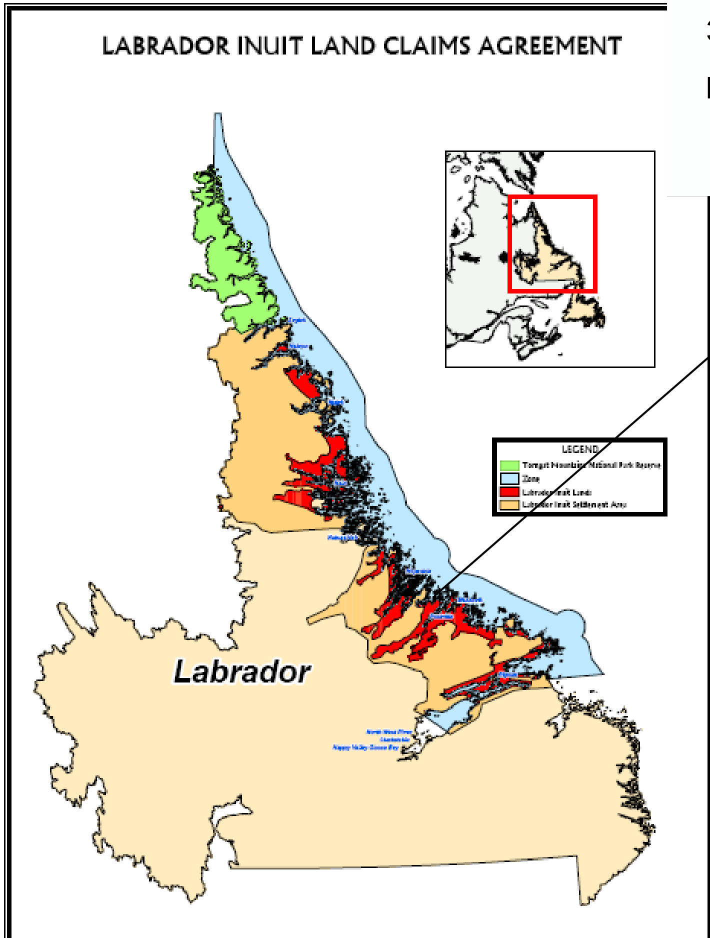
Uranium Mill Tailings are Forever, But Operating Uranium Mines Come and Go



308 PREC25

Les enjeux de la filière uranifère au Québec

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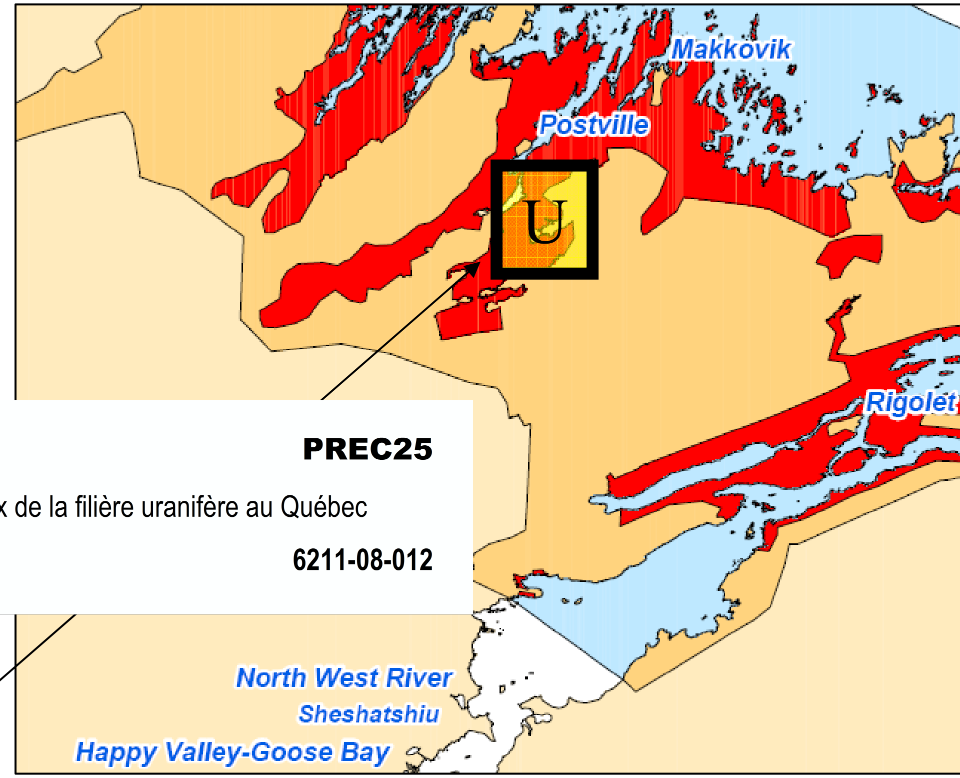


Nunatsiavut Assembly Meeting November 20, 2007

Presentation by
Paul Robinson
Southwest Research and Information Center
PO Box 4524
Albuquerque, NM 87106
sricpaul@earthlink.net

“How safe are the most recent technologies for uranium tailings disposal and containment?”

“Tailings are the greatest long-term source of potential environmental contaminants associated with these [uranium development] projects.

“Construction of reliable tailings management facilities is, therefore, of primary importance. We recommend the use of subsurface deposition in mined-out pits.

“Care should be taken when a site is selected for subaqueous tailings disposal.

“It is usually better to choose a site after the pit has been completely mined out and the geology and hydrogeology of the surrounding formations have been thoroughly studied.”

http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=497&oid=768

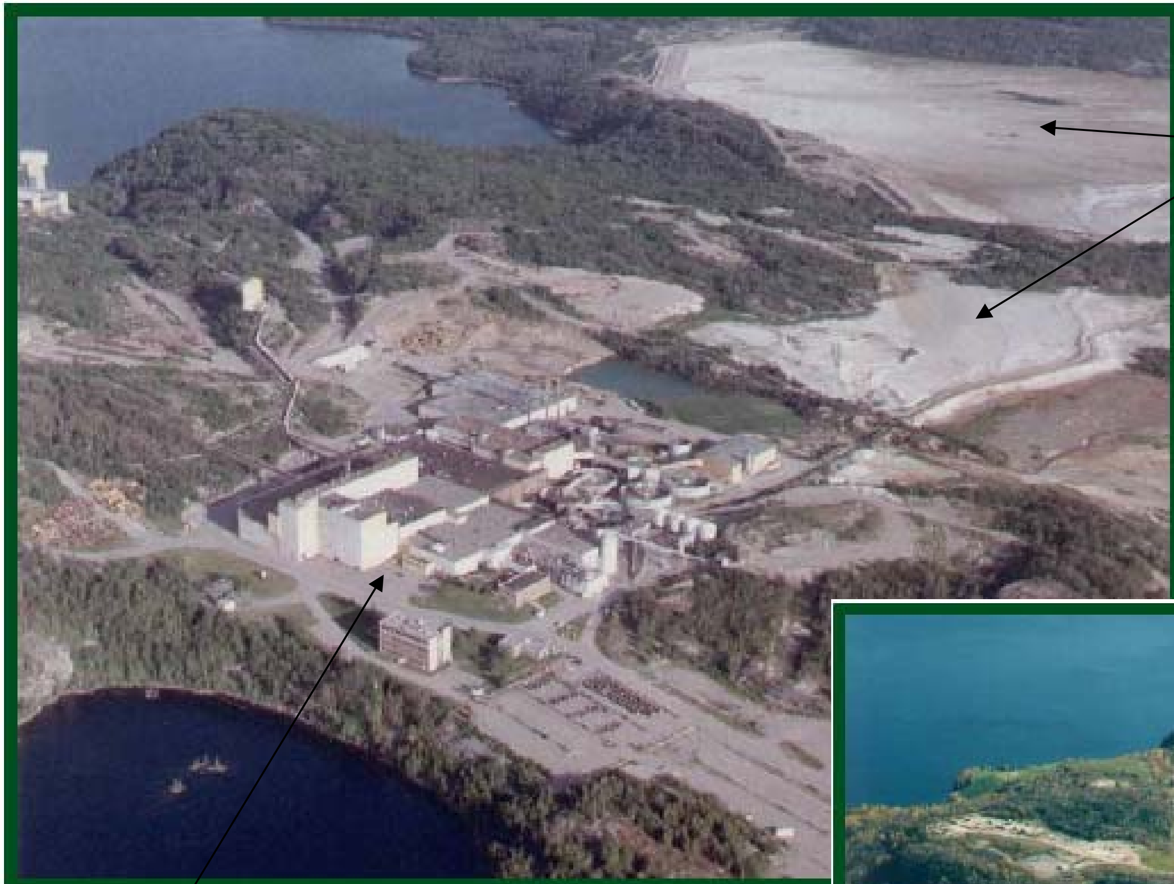
Government of Canada Response to the Reports of The Joint Federal-Provincial Panel on Uranium Mining Developments in Northern Saskatchewan Re: The Cigar Lake and Midwest Projects, and Cumulative Observations

(C) Cumulative Observations - ***Recommendation 6 [Tailings Management Facilities - 7.6]***

Recommendation: If the question of uranium mill tailings technology safety is part of the process of development of an effective uranium policy, then development of a program to establish an effective policy and the support system – research, community consultation, policy deliberation, staff, funds – may be appropriate.

Establish a procedure for developing a thorough and effective policy and consideration of a moratorium - a delay on further activities until a uranium policy is adopted - or other mechanisms to defer uranium development activity until a thorough and effective policy is developed.

Appropriate existing rights should be retained pending the completion of the moratorium following adoption of uranium policy.



Elliot Lake - Denison Mines

Before Reclamation and After Reclamation

2. “Uranium mill tailings are of particular environmental concern because they:

- Retain the majority of the radioactivity of the ore from which they are derived

- their **radioactivity is very long lived**

- **contain** a range of **biotoxic heavy metals and other compounds**

- **may contain sulfidic minerals** and thus prone **to generate acid mine drainage**

- their granular to slime **constituency makes them readily leachable, erodable or collapsible** under different conditions;

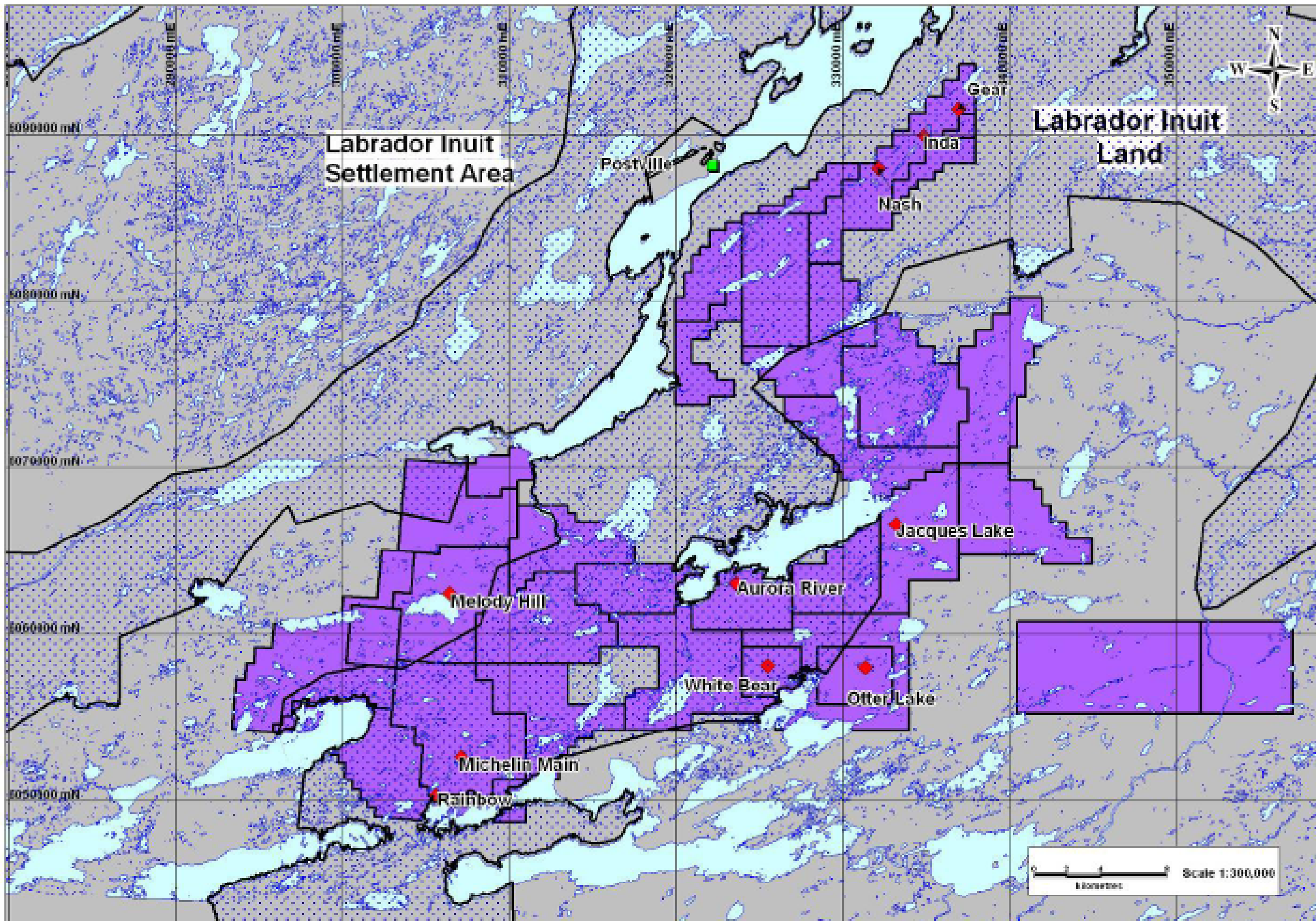
- the **common method of surface disposal** exposes a large surface area to the natural elements and thus **increases the risk of release of radiation flux, radioactive and geochemically toxic dusts, and interaction with surface water systems**; and
- the large surface area of these generally thin **tailings deposits (or ‘piles’) adversely affects large areas of land and renders potentially valuable land unfit for other uses.**

http://www-pub.iaea.org/MTCD/publications/PDF/te_1403_web.pdf

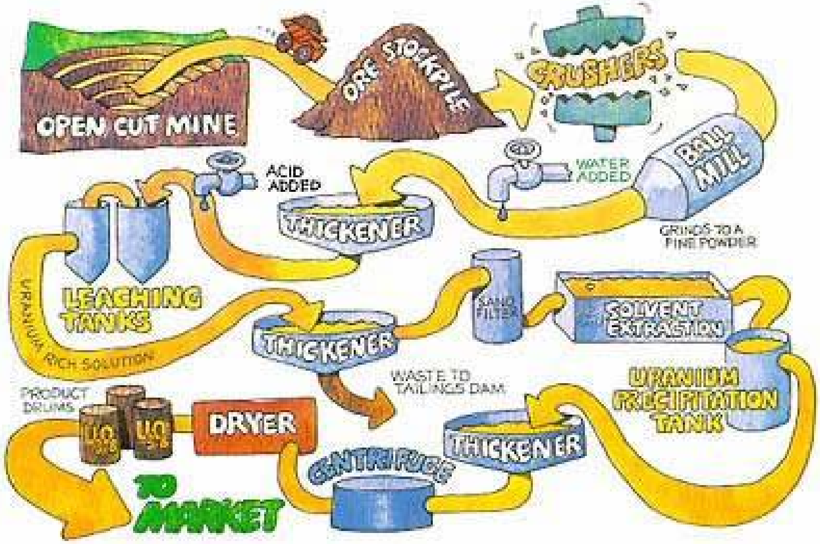
The Long Term Stabilization of Uranium Mill Tailings, IAEA, VIENNA, 2004, IAEA-TECDOC-1403 – p. 6

Aurora Uranium Property and Inuit Land and Settlement Areas - Aurora NI43-101 Report - March 2007

Figure 6.2: Mineral Tenure Map – CMB Uranium Property



*Map co-ordinates are NAD 83, Zone 21


OPEN CUT MINE
ORE STOCKPILE
CRUSHERS
BALL MILL
WATER ADDED
GRINDS TO A FINE POWDER
ACID ADDED
THICKENER
LEACHING TANKS
URANIUM RICH SOLUTION
THICKENER
SAND FILTER
SOLVENT EXTRACTION
WASTE TO TAILINGS DAM
URANIUM PRECIPITATION TANK
THICKENER
CENTRIFUGE
DRYER
PRODUCT DRUMS
TO MARKET

The Characteristics of Uranium Mill Tailings are essential to to understand in order to consider the types of risks and hazards associated with their long-term management

"Uranium mill tailings are waste products of the milling of natural uranium ore.

Milling involves grinding, separating and concentrating natural uranium ore to produce uranium oxide – U_3O_8, called "yellowcake".

The yellowcake produced at the mills is the source material - the raw material – processed to produce the enriched uranium components at the core of nuclear weapons and power reactors.

“Uranium mill tailings accumulate rapidly as uranium ore is processed.
Uranium ores mined in the US and Elliot Lake Ontario occurred at a uranium concentration – ore grade - of approximately 0.1% natural uranium.

The 0.1 % ore grade is similar to the content reported so far for the Michelin or Jacques Lake uranium resources.

To concentrate the uranium ore to produce yellowcake - typically 95% U3O8 (uranium oxide) with the appearance of a yellow powder - uranium mills would process 1000 tons of ore at 0.1% uranium for every one ton of yellowcake produced.

1000 tons of ore at 0.1 % uranium produces 999.9 tons of tailings and 0.1 ton of uranium.
(This is similar to taking $10.00 of tailings for every $0.01 cents - one penny of uranium)

Waste liquids are an important component of uranium mill tailings and play a major role in the release of contaminants by seepage through tailings piles. Liquids including make up water and reagents discarded after use in the uranium mills discarded and are produced in volume similar to the volume of tailings. Uranium mill tailings are typically produced as a slurry containing approximately 50% solid and 50% liquid.

"Uranium milling removes and concentrates only uranium in the ore and leaves most of the uranium's radioactive decay products in the tailings.

Because uranium-238 makes up more than 99% of "natural uranium," its decay products are the source of most of the concern related to radioactive releases from uranium mill tailings.

These decay products include very long half-life isotopes - such as radium 226 and thorium 230 - and very short half- life – radon 222 and its decay product, called "radon daughters" or "radon progeny" which have well documented health effects.

Source:
Uranium Mill Tailings Remediation Performed by the US DOE: An Overview, Paul Robinson
Southwest Research and Information Center Albuquerque, NM USA, May 2004,
http://www.sric.org/U_Mill_Tailing_Remediation_05182004.pdf

The amount of hazardous constituents in uranium tailings and other wastes and they risk the present varies for each specific waste facility, waste facility location and waste facility technology

Risks at specific sites usually include:

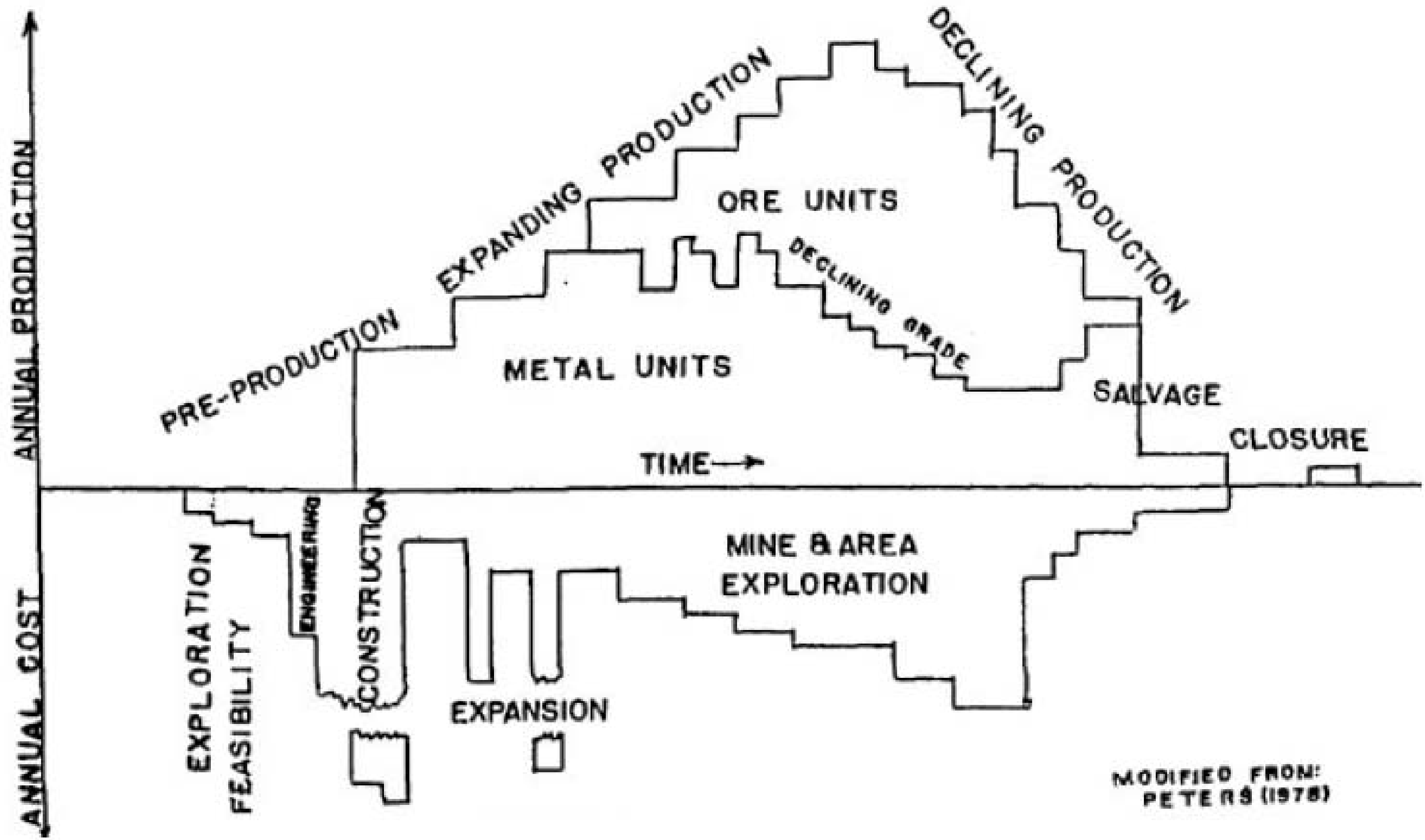
- Environmental exposures to uranium and its radioactive decay products – radium, thorium, radon and other isotopes among others

- Environmental exposures to heavy metals associated with uranium ore – often including arsenic, cadmium, zinc, copper, selenium, among others

- Acid drainage from waste rock and tailings – due to sulfide content of ore and/or sulfuric acid milling process

Environmental exposures can include releases to air, surface water and groundwater

FINANCIAL AND PRODUCTION LIFE CYCLE OF A MINE



How does a uranium project get to the stage of producing tailings?
The Stages in Uranium Development - I
Similar to other mining

Land acquisition: Key stage to controlling future mine and mill site – Key stage for concerned local communities to monitor for and establish land control and access rights or limitations.

Exploration: Initial investigation of site for ore grade rock – can include land disturbance, road building – associated with trenching and drill sites, drilling through underground water resources, potential for releases of drilling muds, fuels and other chemicals. Baseline data for air, water, climate and biological conditions and multiple sites should occur prior to any significant disturbance and continue for 1 – 3 years to establish strong database.

Development: Detailed investigation of site to determine extent and grade of ore – can include extensive land disturbance – drill sites only 10 – 30 meter apart, potential for releases of drilling muds, fuels and other chemicals.

Exploration and development permits should only be issued if plans include reclamation plans include sufficient financial assurance to guarantee "third-party" restoration of all disturbances within specific timeframe if no mine developed.

The Stages of Uranium Development – II

Mining: Construction of open pit or underground mines generally includes extensive land disturbance, intrusion into ground water resources, disruption of surface water flows, release of air and water contaminants. Creation of waste rock piles with radioactive and heavy metal content. Waste rock can be 5 – 10 times volume of ore. Mines should be designed for effective closure including leak prevention and detection at waste rock and mine sites, ground and surface water protection and/or diversion, and air, water and biological monitoring.

Mine and mill permits should only be issued if plans include full-scale decommissioning/reclamation plan including sufficient financial assurance to guarantee "third-party" completion of all elements.

Milling: Construction of mill buildings and mill waste – tailings – facilities. Tailings usually contain 99.9% of the volume of the ore and most of the hazardous constituents from ore including: all radionuclides other than uranium – radium, thorium, radon, etc., all heavy metals found in ore, and residual mill reagents –often sulfuric acid, kerosene, ammonia, among others.

The Stages of Uranium Development – III

In situ leaching mining: Mining methods uses boreholes to inject fluids to mobilize uranium in rock that is recovered by pumping production wells. Can mobilize other radionuclides and heavy metals in ore. Can damage groundwater resources associated with ore. Can result in surface spills and release from is found. Extensive drillhole network can result in extensive land disturbance.

Decommissioning/Reclamation/Closure: Closing of mine and mill sites usually includes dismantling of all building, buildings, Covering, regrading and revegetation or rock armoring of waste rock and tailings piles to prevent infiltration of moisture and release of hazardous materials due to erosion.

Insitu decommissioning/reclamation should include removal restoration of affected water resources to at or near background concentrations of all constituents, removal of all drilling equipment and restoration of surface to pre-existing or desired conditions.

Post-Closure Care: Monitoring, maintenance and repair of waste rock and tailings containment systems.

Tailings Disposal Options

Above Ground

Below Ground: In Pit

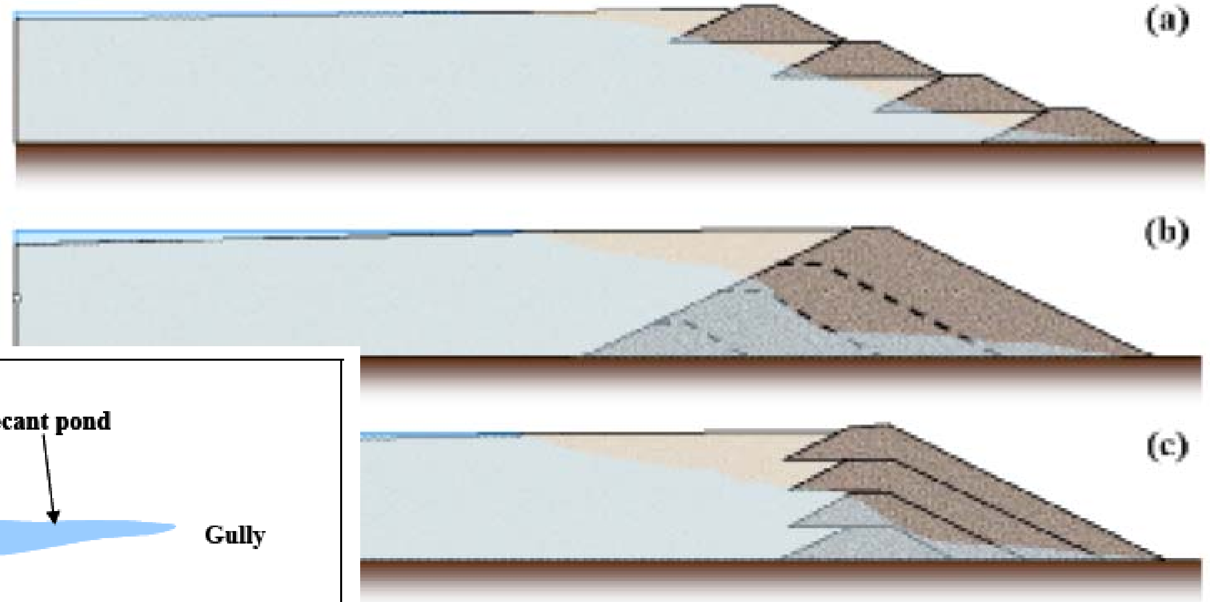
Below Ground: In Underground Workings

Below: Purpose-Built Containment
underground void or surface pit

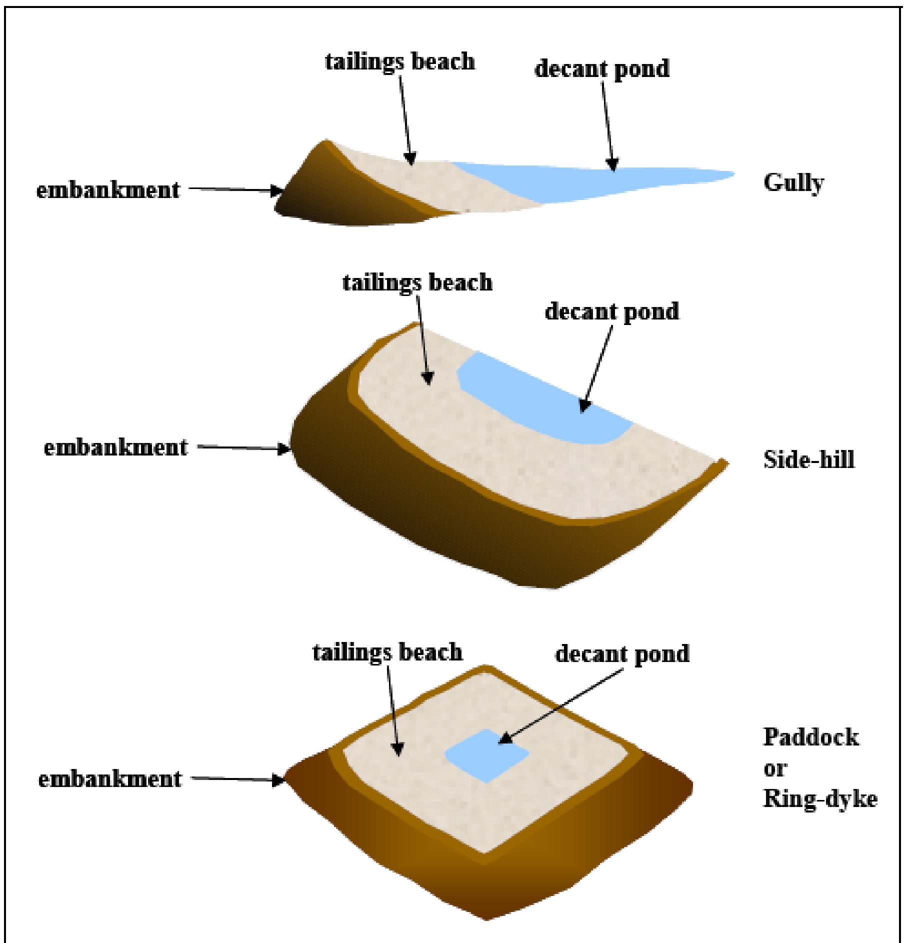
Deep Lake

http://www-pub.iaea.org/MTCD/publications/PDF/te_1403_web.pdf
The Long Term Stabilization of Uranium Mill Tailings, IAEA, VIENNA, 2004, IAEA-TECDOC-1403 – p. 6

Above Grade



(a)
(b)
(c)

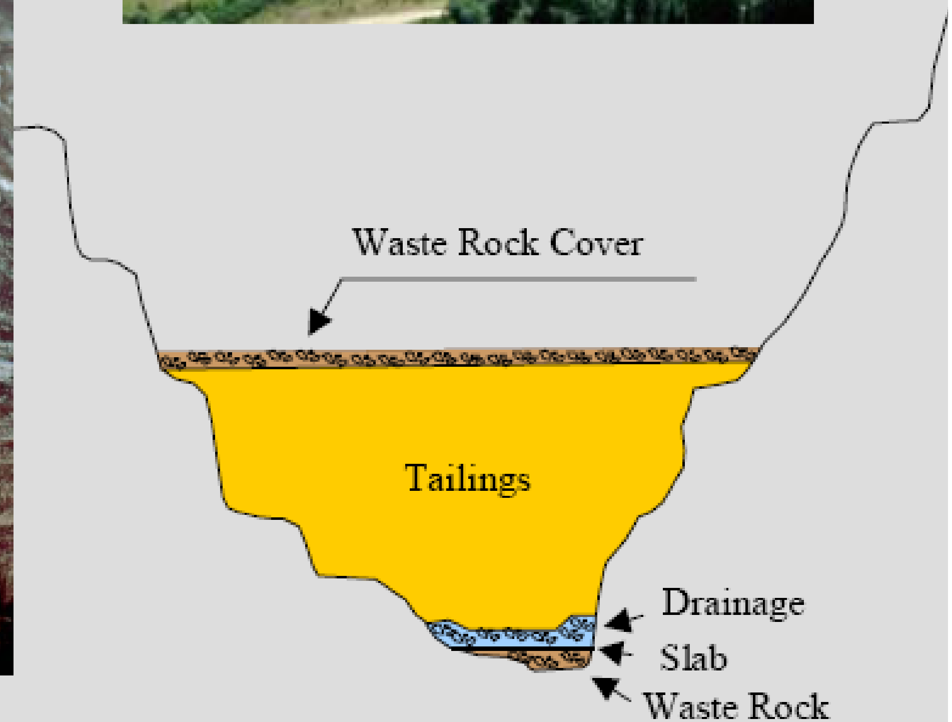


tailings beach
decant pond
embankment
Gully
tailings beach
decant pond
embankment
Side-hill
tailings beach
decant pond
embankment
Paddock
or
Ring-dyke

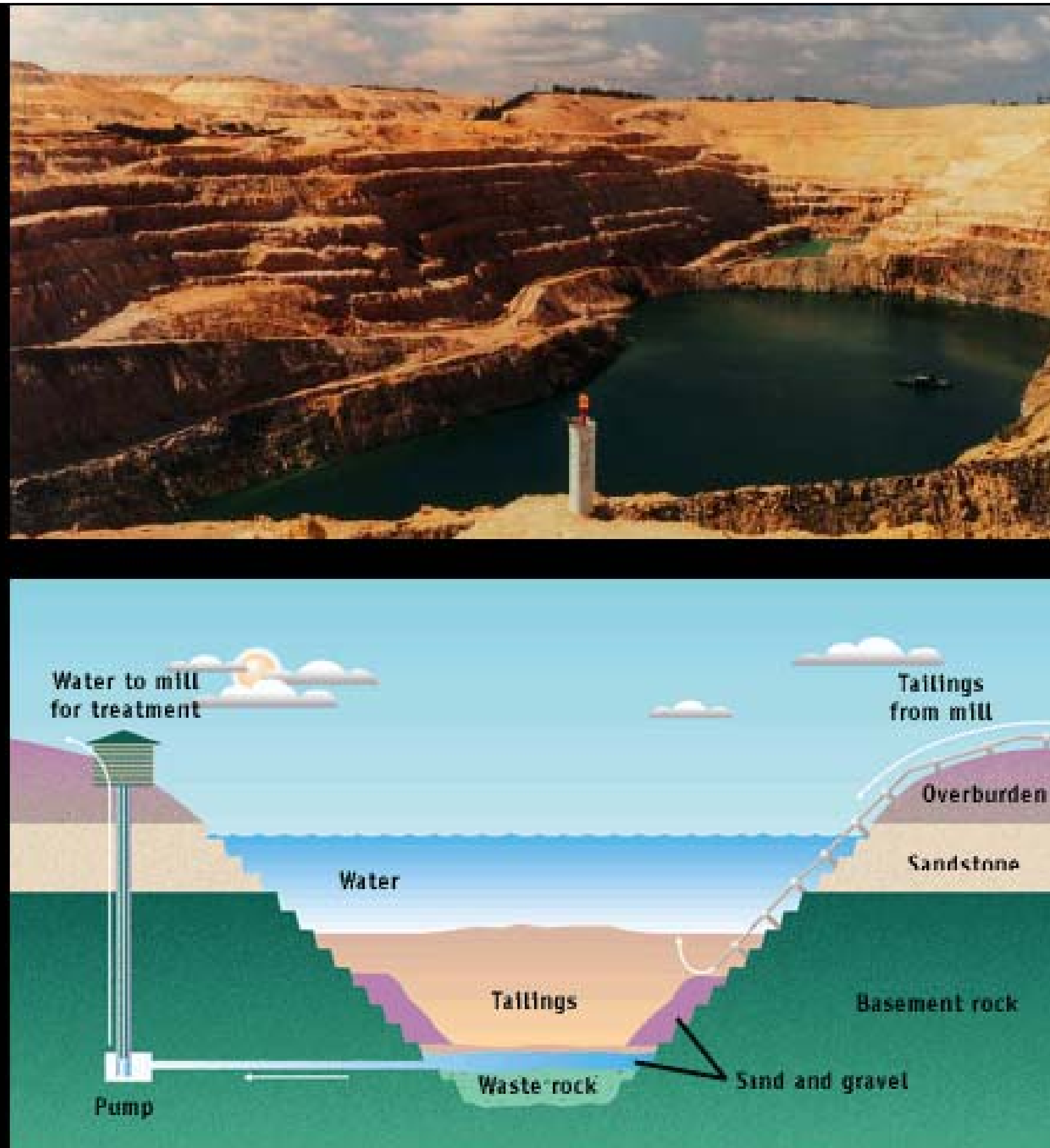
Below Ground: In Pit

Tailings disposal in Bellezane MCO 105 open pit (Haute Vienne, France)

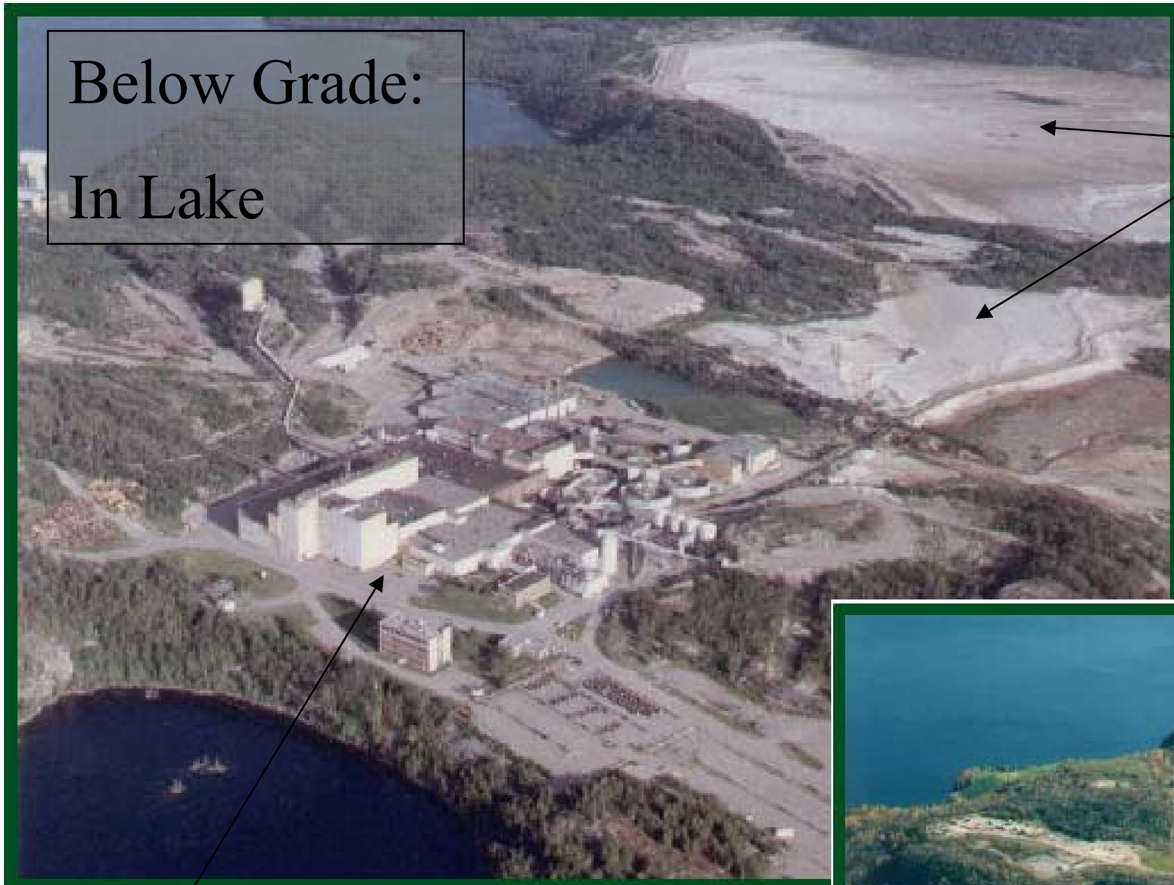
1992



Below Grade : In Pit



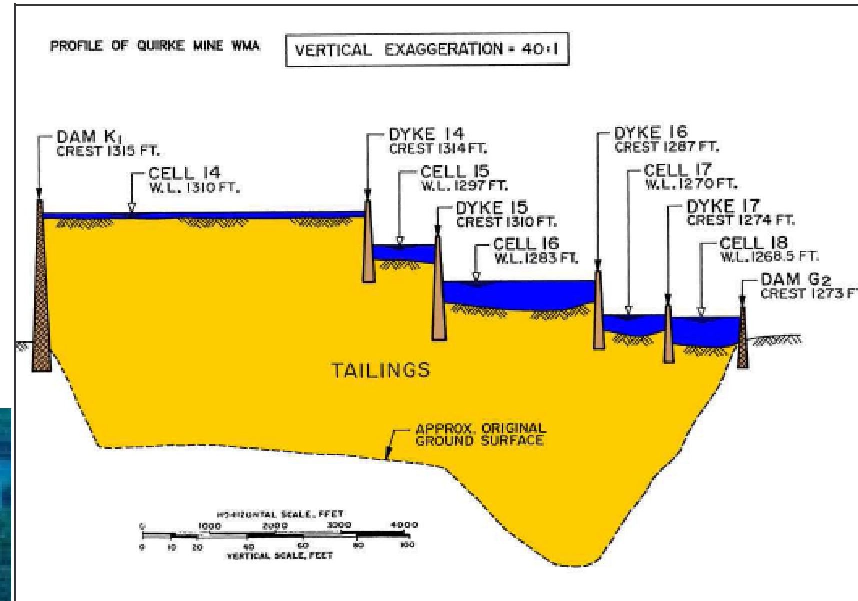
Tailings disposal in Deilmann open pit, Key Lake, Saskatchewan, Canada (Cameco)



Elliot Lake - Denison Mines

Before Reclamation and After Reclamation

Below Grade: In Lake



Rio Algom Quirke tailings, Elliot Lake, Ontario, Canada

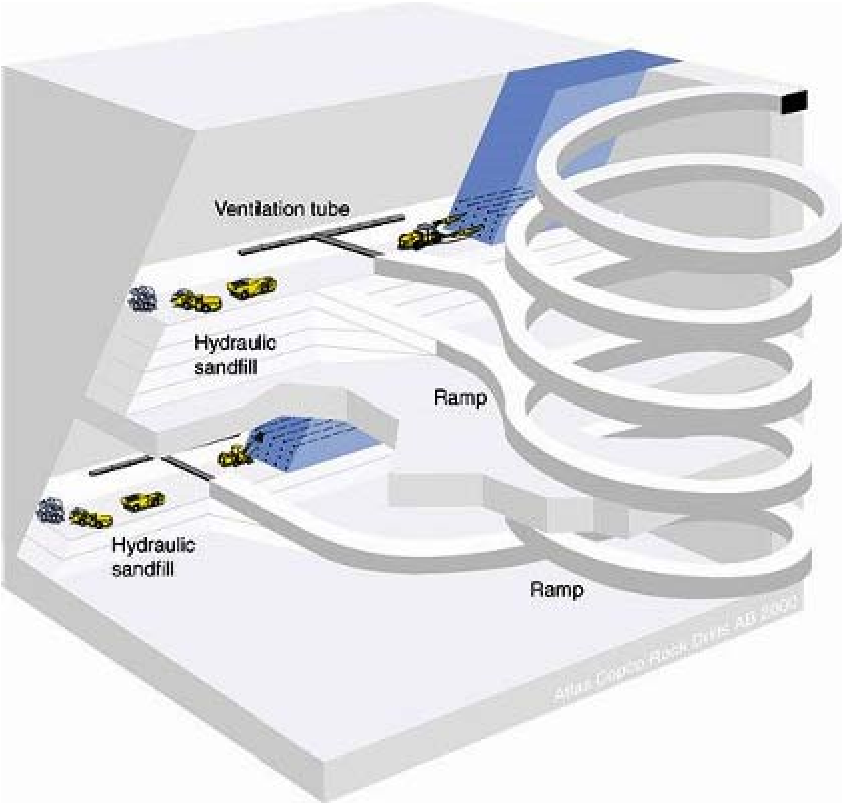
Elliot Lake
Rio Algom Tailings
Quirke Lake

Below Grade:

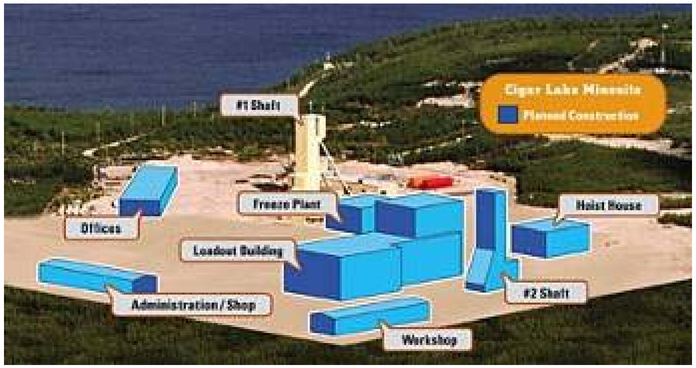
In Pit

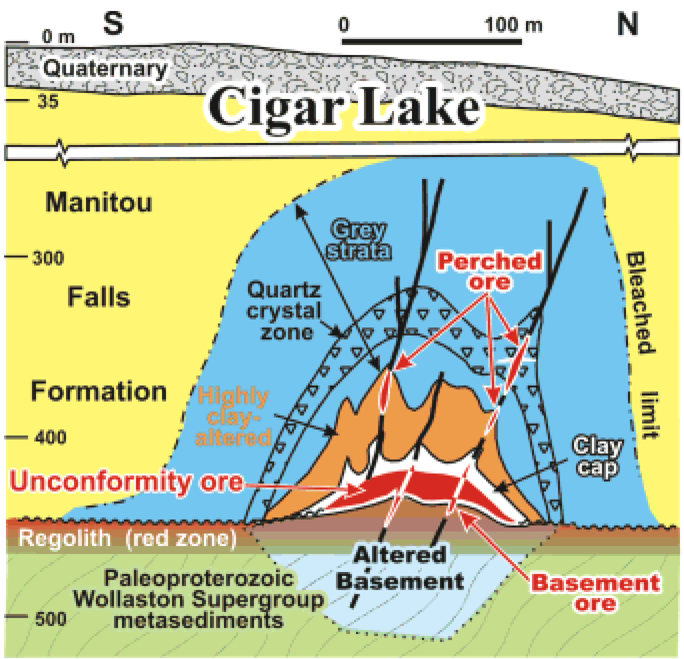
JEB pit - Saskatchewan
McClean Mill Tailings

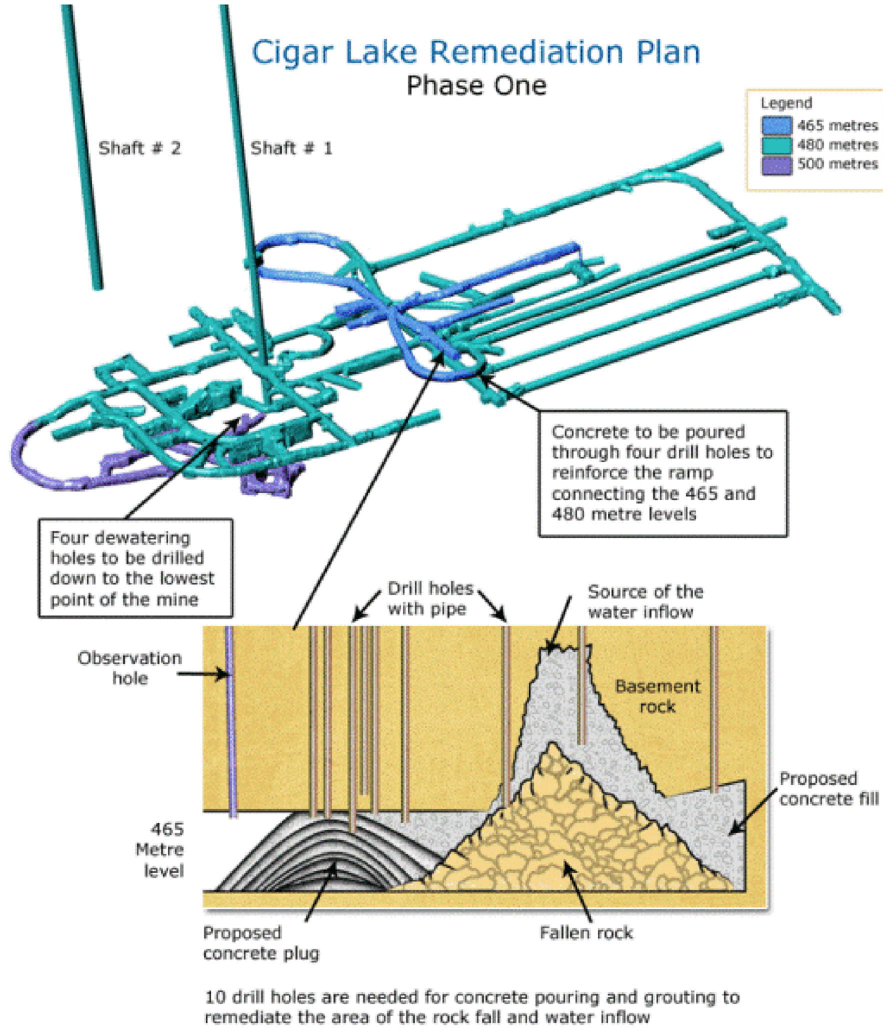
Below grade: In Underground Workings



Cigar Lake - Modern Uranium Mine with a Major Problem - Mine closure due to unforeseen and extensive mine flooding problem







October 23 2006 - Cameco Corp. said its Cigar Lake underground uranium project in northern Saskatchewan is expected to flood completely after a rockfall yesterday.

Cameco said the fall occurred Sunday afternoon in an underground area that had been dry and a "significant" amount of water started flowing in.

Cameco's Cigar Lake mine inundated; stock falls; Last Updated: Monday, October 23, 2006 | 3:50 PM ET CBC News http://www.cbc.ca/money/story/2006/10/23/cameco.html

TORONTO, Nov 6, 2007 (Reuters) - Cameco doesn't have a "fixed" deadline for the overhaul of its flooded Cigar Lake mine, the uranium miner's chief operating officer said in documents made available on Tuesday.

At a hearing last week before the Canadian Nuclear Safety Commission (CNSC), which is considering extending Cameco's construction license to rehabilitate the mine, COO Tim Gitzel said Cameco, the world's largest uranium producer, would not take shortcuts in the overhaul process.

No set deadline for Cigar Lake repairs -Cameco COO | Reuters Wed Nov 7, 2007 7:26 PM EST - http://energynet.newsvine.com/_news/2007/11/07/1080920-no-set-deadline-for-cigar-lake-repairs-cameco-coo-reuters

Below grade: in Purpose-built Containment - In Operation

White Mesa Uranium Mill, UT - Now owned by Denison Mines

Long Term Stabilization of Uranium Mill Tailings, IAEA-TECDOC-1403, p. 54

http://www-pub.iaea.org/MTCD/publications/PDF/te_1403_web.pdf

Tailings Disposal Options : Above Ground

Churchrock, New Mexico Tailings Dam - After Dam Break in 1979

Advantages

- Can operate simultaneously with mining
- May be cheap to establish if tailings used in construction
- Valley fill sites may have low construction costs
- Whole tailings can be contained
- Tailings pond can also function as evaporative pan to assist in mine water management
- Most widely used
- Tailings easily accessed for reworking if required

Disadvantages

- Authorities may regard this type as only temporary storage & tailings may need to be relocated e.g. below ground level at end of mine life
- May require construction of associated structures to minimise risk of environmental impact in the case of failure, or to collect/treat seepage etc
- Seepage control essential
- Expensive if built as water containment structure
- Post close-out settlement may take a long time and lengthen period before operator can be released of responsibility
- May need long term maintenance
- Long term risk of tailings spill, increasing as structure weathers and erodes
- Increases land area impacted by mining
- Airborne and waterborne dispersal of contaminants possible following erosion etc

Tailings Disposal Options - Below Ground: In Pit

Advantages

- Very long term containment possible
- Unlikely to ever require maintenance
- Whole tailings can be contained
- Pit preparation costs unlikely to be as high as above ground options
- Airborne dispersal of contaminants effectively impossible
- Structural failure of containment virtually impossible

Disadvantages

- May need pervious-surround work to minimise ground water contamination risk
- Construction cost of impermeable containment could be high if suitable pit not available
- Not normally possible to operate simultaneously with mining at the same location
- Requires a suitable pit to be available pre-mining, or for all ore to extracted prior to milling (e.g. Nabarlek, Northern Territory, Australia)
- May involve double-handing of tailings if no pit available at commencement
- Re-claiming of tailings if required for further treatment will be difficult owing to depth

Tailings Disposal Option -
Below Ground: Underground Mine Workings

Advantages

- Very long term containment possible
- Unlikely to ever require maintenance
- Can possibly incorporate whole tailings
- Can be operated simultaneously with mining
- Airborne dispersal of contaminants effectively impossible
- Structural failure of containment virtually impossible

Disadvantages

- Slimes may need to be contained separately
- Need suitable groundwater conditions
- Mine waste water management system needs to be able to cope with evaporation requirements
- Tailings not available for reprocessing

Tailings Disposal Option - Below Ground:
Purpose-built Containment (underground void or surface pit)

Advantages

- Very long term containment possible
- Unlikely to ever require maintenance
- Whole tailings can be contained
- Can be operated simultaneously with mining
- Airborne dispersal of contaminants effectively impossible
- Structural failure of containment virtually impossible
- Site can be selected in low-permeability country rock
- Benign rock available for unrestricted use in construction

Disadvantages

- Construction required before milling commences
- Mine waste water management system needs to be able to cope with evaporation requirements
- Suitable site may be remote from mill and increase slurry/paste transport and infrastructure costs
- Paste stabilization normally necessary for underground and optional/preferable for pit.

Tailings Disposal Options: Deep Lake

Advantages

- Can operate simultaneously with mining
- Cheap to establish
- Whole tailings can be contained
- Very long term containment possible
- Unlikely to ever require maintenance
- Whole tailings can be contained
- Airborne dispersal of contaminants effectively impossible
- Structural failure of containment virtually impossible

Disadvantages

- Authorities may not allow this approach to tailings disposal
- Requires nearby water body not otherwise used for social or economic benefit (i.e. fishery, water supply, recreation)
- Risk of water contamination and tailings redistribution from disturbance by major flood of changed climatic conditions

Below Grade: in Purpose-built Containment - Decommissioning Complete

Alternate tailings disposal site Bodo Canyon, 12 km from Durango, Colorado, USA, 1992

“Uranium mill tailings can adversely affect public health and the environment

There are four principal ways (or exposure pathways) that the public [wildlife, fish and plants] can be exposed to the hazards from this waste.

[First,] the diffusion of radon gas directly into indoor air if tailings are misused as a construction material or for backfill around buildings. When people breathe air containing radon, it increases their risk of developing lung cancer.

Second, radon gas can diffuse from the piles into the atmosphere where it can be inhaled and small particles can be blown from the piles where they can be inhaled or ingested.

Third, many of the radioactive decay products in tailings produce gamma radiation, which poses a health hazard to people in the immediate vicinity of tailings.

[Fourth,] the dispersal of tailings by wind or water, or by leaching, can carry radioactive and other toxic materials to surface or ground water that may be used for drinking water.”

USEPA, “Uranium Mill Tailings: Radioactive Waste Disposal Environmental Perspective,” US Environmental Protection Agency, May, 2004, http://www.epa.gov/radiation/docs/radwaste/umt.htm

Aurora Energy's 2006 Central Mineral Belt Uranium Resource Summary

-

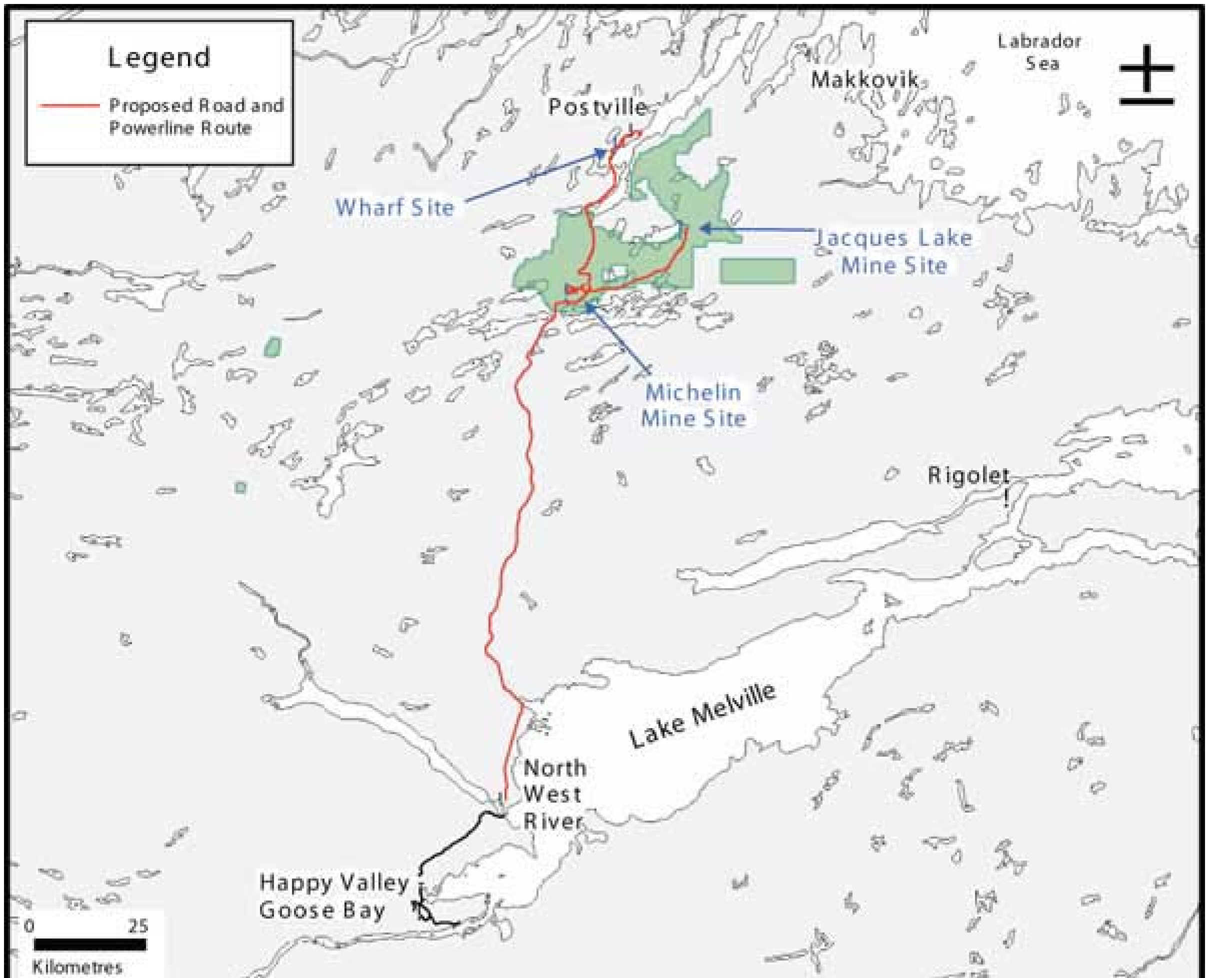
	Measured			Indicated			Inferred		
Deposit	Tonnes	% U3O8	lbs U3O8	Tonnes	% U3O8	lbs U3O8	Tonnes	% U3O8	lbs U3O8
Michelin Open Pit*	3,410,000	0.07	5,340,000	7,930,000	0.06	10,840,000	460,000	0.04	440,000
Michelin Underground**	-	-	-	14,310,000	0.12	36,290,000	13,950,000	0.11	32,610,000
Jacques Lake Open Pit*	-	-	-	1,150,000	0.08	2,100,000	1,520,000	0.06	1,880,000
Jacques Lake Underground**	-	-	-	1,670,000	0.09	3,310,000	1,950,000	0.07	3,100,000

** Open pit resource reported at 0.03% U_3O_8 cut-off*

*** Underground resource reported at a 0.05% U308 cut-off*

Source: "The Exploration Activities of Aurora Energy Resources Inc. on the CMB Uranium Property, Labrador, Canada during the period January 2006 to January 2007 ("Aurora Energy NI43-101 Technical Report") – available at: www.aurora-energy.ca or www.sedar.com.

"An updated resource estimate for Michelin and a preliminary resource estimate for Jacques Lake were completed in February 2007. Together, the two sites have combined measured, indicated, and inferred resources of approximately 96 million pounds of uranium. It is a resource of international significance; at its present size, it could provide fuel to feed almost half of the world's commercial nuclear reactors for one year.

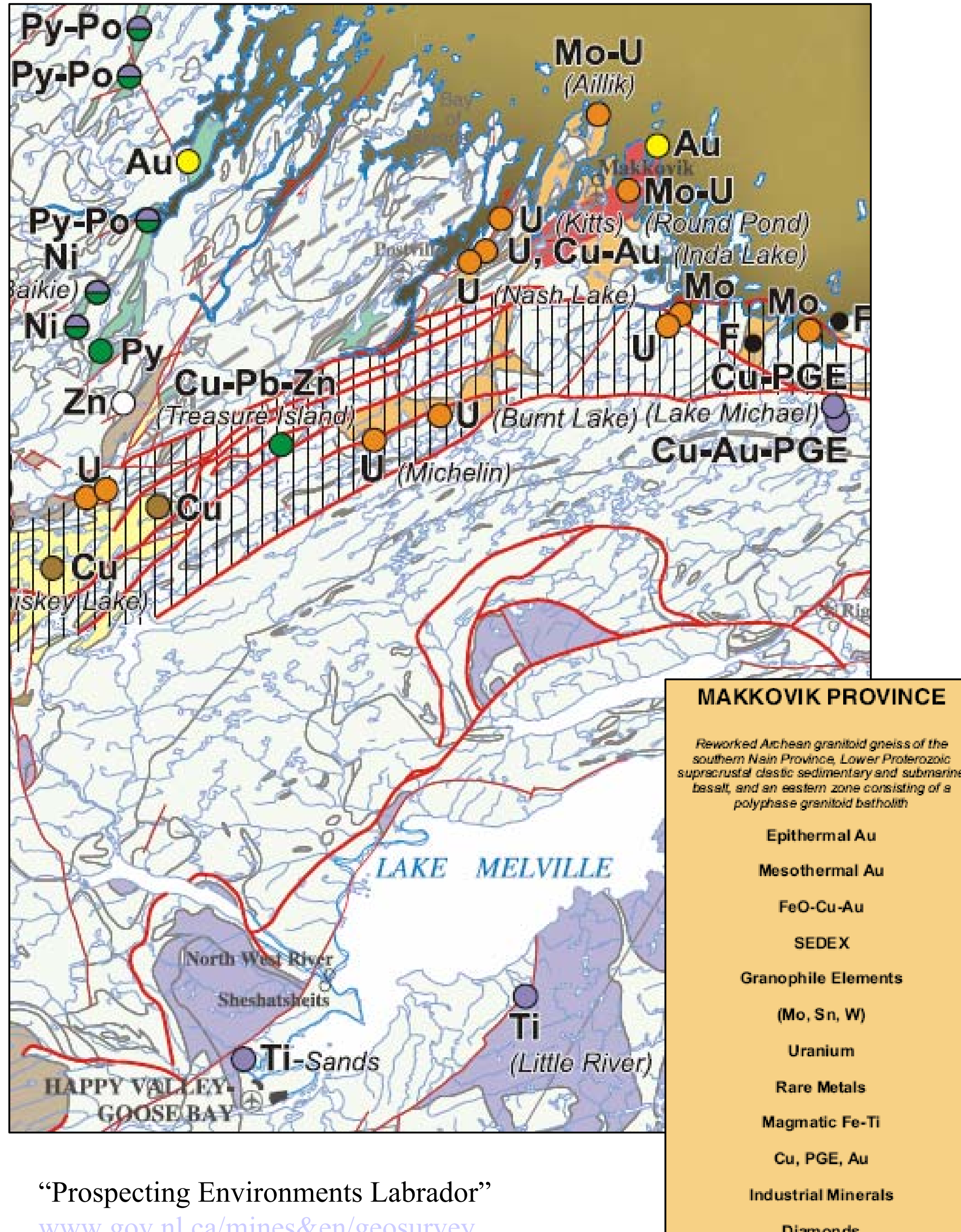


"The Michelin and Jacques Lake deposits would be mined using traditional open-pit and underground methods. A conventional leach mill would be located at site. It would use standard crushing, grinding, and leaching techniques to process the ore into concentrate. The infrastructure and services to support mining and milling activities could include a road system, a dock with deepwater ocean access, grid power, and permanent accommodations for 400-500 people.

“Tailings and waste management plans are currently being developed. Once a decision on tailings and waste management is made, further information on its related infrastructure will be available….”

“Metallurgical testing and analytical studies on the rock hosting the Michelin and Jacques Lake deposits, and the wall rocks surrounding the deposits, have not identified any concentrations of deleterious heavy metals (e.g., selenium, molybdenum, nickel, mercury, etc.). Aurora does not anticipate heavy metals processing issues in the milling operation. Also, Aurora does not anticipate having to treat processed water for heavy metals before final discharge.

Source: http://www.aurora-energy.ca/?p=projects&s=Michelin+Project



“Prospecting Environments Labrador”
www.gov.nl.ca/mines&en/geosurvey

URANIUM DEMAND

Annual uranium consumption in 2005 was approximately 70,000 tonnes.

Even at the most optimistic of growth projections, future uranium consumption would top off at 125,000 tonnes by 2025; consumption of uranium as nuclear reactor fuel would be even less under more moderate growth predictions.

These uranium demand figures are dwarfed by the known recoverable uranium resource in 2005:
4.7 million tonnes, which represents more than 67 years of world requirements at the 2005 rate of 70,000 tonnes.

Using the 2025 medium growth scenario of 100,000 tonnes, the 2005 uranium resource total would provide more than 47 years of world requirements.

World uranium demand projections are updated frequently by World Nuclear Association and other sources to reflect changing market conditions.

"**The world's present measured resources of uranium in the lower cost category (3.5 million tonnes) and used only in conventional reactors, are enough to last for some 50 years.** This represents a higher level of assured resources than is normal for most minerals." - World Nuclear Association, 2003

By 2005, WNA's global total of known recoverable uranium resources had increased by 34% to 4.7 million tonnes.

The 1.2 million tonnes of additional uranium in unmined deposits identified in just the last three years

is roughly equal to the total amount of uranium consumed by the nuclear weapons and reactor industry from its inception in the 1940s through 2005.

http://www.sric.org/voices/2006/v7n3/Need_Greed.html

INCREASES IN KNOWN RECOVERABLE URANIUM RESOURCES - 2003 – 2005

$80/pound ($176/kilogram) cost category

1 tonne = 1 metric ton = 2,200 pounds

Sources: World Nuclear Association 2006 Symposium, International Atomic Energy Agency

COUNTRY	TONNES U 2003	WORLD % 2003	TONNES U 2005	% INCREASE 2003-2005	WORLD % 2005
Australia	989,000	28%	1,143,000	16%	24%
Kazakhstan	622,000	18%	816,000	31%	17%
Canada	439,000	12%	444,000	1%	9%
South Africa	298,000	8%	341,000	16%	7%
Namibia	213,000	6%	282,000	33%	6%
Brazil	143,000	4%	279,000	97%	6%
Russian Fed.	158,000	4%	172,000	9%	4%
USA	102,000	3%	342,000	235%	7%
Uzbekistan	93,000	3%	116,000	20%	2%
All Other Countries	**480,000**	**14%**	**808,000**	**68%**	**18%**
World total	**3,537,000**		**4,743,000**		**34%**

Uranium Deposits around the World

Deposit name;

Country;

Mine type - OP - Open Pit/UG

UG - Underground;

Deposit Status - O - Open/P - Proposed;

Uranium Concentration - ore grade (%U)

Uranium Content - Tonnes U

Source: www.wise-uranium.org and www.world-nuclear.org

Lagerstätte	Land	Bergwerks-Typ	Status	Urankonzentration [%U]		Inhalt [t U]	Gesamt
McArthur River	Kanada	UG	O	sehr hoch	17.96%	151883	279510
Cigar Lake	Kanada	UG	P		13.70%	127627	
Midwest	Kanada	UG	P	hoch	3.80%	13200	52596
McClean Lake	Kanada	OP, UG	O		2.00%	19300	
Dawn Lake	Kanada				1.51%	8585	
Rabbit Lake	Kanada		O		1.10%	11511	
Koongarra	Australien			gut	0.68%	12330	305524
Jabiluka	Australien	UG			0.43%	60208	
Baker Lake	Kanada				0.41%	15094	
Akouta	Niger	UG	O		0.38%	29000	
Cerro Solo	Argentinien				0.35%	2200	
Arlit	Niger	OP	O		0.30%	14000	
Roco Honda	USA				0.26%	4600	
Kintyre	Australien				0.26%	30000	
Lagoa Real	Brasilien		O		0.25%	79712	
Ranger	Australien	OP	O		0.24%	51300	
Sheep Mountain	USA		P		0.21%	3080	
Ben Lomond	Australien				0.21%	4000	
Mardain Gol	Mongolei			mäßig	0.19%	1005	759136
Sierra Pintada	Argentinien				0.19%	2440	
Dornod	Mongolei				0.18%	20000	
Krasnokamensk	Rußland	UG	O		0.18%	170000	
Beverley	Australien	ISL	O		0.15%	17800	
Kayelekera	Malawi				0.16%	9920	
Gurvanbulag	Mongolei				0.15%	16040	
Nemer	Mongolei				0.15%	2528	
Yeelirrie	Australien				0.13%	44100	
Aldansky	Rußland	UG			0.13%	200000	
Nose Rock	USA				0.12%	5624	
Valhalla	Australien				0.12%	14000	
Angela	Australien				0.11%	9752	
Michelin	Kanada				0.11%	7000	
Imouraren	Niger				0.11%	80000	
Nisa	Portugal				0.11%	1923	
Skal	Australien				0.11%	2923	
Frank M	USA				0.10%	1350	
Maureen	Australien				0.10%	2544	
Macusani	Peru				0.10%	1790	
Oobagooma	Australien				0.10%	8438	
Mulga Rock	Australien				0.10%	13000	
Manyingee	Australien	ISL			0.10%	6665	
Goulds Dam	Australien	ISL			0.10%	1696	
Honeymoon	Australien	ISL			0.10%	2798	
Westmoreland	Australien				0.10%	17300	
Ingulsk'ii	Ukraine	UG	O		0.10%	27000	
Karkhu	Rußland				0.10%	7000	
Severinskoye	Ukraine				0.10%	50000	
Zarechnoye	Kasachstan	ISL		P	0.10%	14500	

Michelin Project - Underground Mine - Indicated Resources - 0.12% - 16495 tonnes

Michelin Deposit -

Open Pit Measures Resources - 0.07% - 2515 tonnes

Underground Mines Indicated Resources - 0.12% - 16495 tonnes

Jacques Lake Deposit -

Open Pit Indicated Resources - 0.08% - 954 tonnes

Underground Indicated Resources - 0.09% - 1504 tonnes

Source:Aurora NI43-101March 2007Report

Lagerstätte	Land	Bergw.-Typ	Status	Urankonzen-tration [%U]		Inhalt [t U]	
							Gesamt
Workman Creek	USA				0.093%	3773	
Langer Heinrich	Namibia	OP	P		0.093%	9459	
Hansen	USA				0.086%	10654	
Smith Ranch	USA	ISL	O		0.085%	12500	
Domiasiat	Indien		P		0.085%	7819	
Dieter Lake	Kanada				0.085%	42300	
Reno Creek	USA	ISL			0.063%	2271	
Antelope	USA				0.060%	5770	
Saelices el Chico	Spanien				0.060%	8500	
Olympic Dam	Australien	UG, BP	O		0.053%	302000	
Vitimsky	Rußland	ISL	P	niedrig	0.051%	15500	753134
Nowthanna	Australien				0.046%	2317	
Lambapur Pedagattu	Indien		P		0.044%	5900	
Lake Maitland	Australien				0.043%	5000	
Aurora	USA				0.042%	6359	
Jaduguda	Indien	UG	O		0.040%	?	
Inkay	Kasachstan		P		0.040%	35194	
Rietkuil	Südafrika	BP			0.037%	143000	
Munkuduk	Kasachstan				0.035%	49000	
Napperby	Australien				0.034%	5088	
Rössing	Namibia	OP	O		0.029%	80730	
Highland	USA	ISL	O		?	2810	
Taylor Ranch	USA	ISL			?	3850	
Ruby Ranch	USA	ISL			?	1848	
Bear Creak	USA	ISL			?	1848	
Peach	USA				?	1771	
JAB	USA				?	1154	
Gas Hills	USA	ISL	P		?	7007	
Charlie	USA				?	1610	
Vasquez	USA	ISL	O		?	1425	
Dewey/Burdock	USA	ISL			?	2387	
Ram Claim	USA				?	2300	
Mt Taylor	USA			Unbe-kannt	?	38500	281261
Hosta Butte	USA	ISL			?	5000	
Crownpoint	USA	ISL	P		?	15000	
Church Rock	USA	ISL	P		?	7350	
Big Red	USA	ISL			?	2348	
Crow Butte	USA	ISL	O		?	3465	
Schwartzwalder	USA				?	6150	
Itataia	Brasilien				?	77337	
Vatutinskii	Ukraine	UG	O		?	25500	
Muyunkum	Kasachstan				?	43700	
Gurvan Saihan	Mongolei				?	8701	
Dalmatovkoye	Rußland	ISL	O		?	10200	
Malinovskoye	Rußland	ISL			?	10000	
Gesamt							**2431161**

BP = Nebenproduct, ISL = in-situ leaching, OP = Tagebau, UG = unter Tage
O = in Betrieb, P = geplant

Uranium Policy Examples – Many indigenous communities and other governments have addressed the need to develop policy to address uranium mining proposals and other mining activities.

Recent examples include:
Policy Concerning Uranium Mining in Nunavut, Nunavut Tunngavik - http://www.tunngavik.com/english/pdfs-english/URANIUM%20POLICY%20September%2011,%202007%20All%20Lang.pdf

"NTI has established this **Policy Concerning Uranium Mining in Nunavut** to assist in carrying out its responsibilities under the Nunavut Land Claims Agreement. This policy—which may be referred to as "The Uranium Policy"—was approved by the Board of Directors on September 11, 2007. Readers should refer to **Background Paper on the NTI Uranium Policy** http://www.tunngavik.com/english/pdfs-english/BACKGROUND%20PAPER%20for%20Uranium%20Policy%20September%2011,%202007%20All%20Lang.pdf for additional information"

Description from CBC NEWS:

Nunavut Inuit group announces uranium mining policy - http://www.cbc.ca/canada/north/story/2007/09/19/nu-uranium.html?ref=rss

CBC News, Wednesday, September 19, 2007 | 3:29 PM CT

Nunavut's Inuit organization says its uranium policy, announced on Tuesday, lays out the terms under which it will support uranium mining in the territory, while making sure such development benefits Inuit.

Executive members of Nunavut Tunngavik Inc. voted unanimously to approve the new policy at a meeting in Arivat last week. It lays out NTI's position on uranium development, as interest in such development has been growing in recent years.

NTI is the organization responsible for enforcing the Inuit land claim that resulted in the creation of Nunavut.

"It's a policy that will guide us, how we're going to tackle the uranium issue in the Nunavut area," NTI first vice-president James Eetoolook told CBC News on Tuesday. Eetoolook said the policy ensures that NTI will not support proposed uranium mining projects "if it will damage the environment, the health of Inuit and the wildlife." The 20 policy statements also call for "responsible and peaceful uses" for nuclear energy and exploration, as well as projects that promote Inuit participation in the regulatory and operation processes.

The mining industry has been eyeing large uranium deposits near the communities of Baker Lake and Kugluktuk….

Dine Natural Resources Protection Act - http://www.sric.org/uranium/DNRPA.pdf

NAVAJO NATION PRESIDENT SIGNS BILL BANNING URANIUM MINING AND MILLING

Crownpoint, N.M., April 29, 2005. Navajo Nation President Joe Shirley, Jr., today signed what is believed to be the first Native American tribal law banning uranium mining and milling. With dozens of community members and dignitaries looking on, Shirley signed the Diné Natural Resources Protection Act (DNRPA) of 2005, which was passed by the Navajo Nation Council by a vote of 63-19 on April 19. As amended by the Council during floor debate, the act states, "No person shall engage in uranium mining and processing on any sites within Navajo Indian Country." The law is based on the Fundamental Laws of the Diné, which are already codified in Navajo statutes. The act finds that based on those fundamental laws, "certain substances in the Earth (*doo nal yee dah*) that are harmful to the people should not be disturbed, and that the people now know that uranium is one such substance, and therefore, that its extraction should be avoided as traditional practice and prohibited by Navajo law."

Navajo Nation President Joe Shirley, Jr.
signs Diné Natural Resources Protection Act of 2005

New law bans uranium mining, processing throughout Navajo Nation

CROWNPOINT, N.M. − Navajo Nation President Joe Shirley, Jr., today closed the book on a 65-year legacy of death and disease by making uranium mining and processing illegal on the Navajo Nation.

"As long as there are no answers to cancer, we shouldn't have uranium mining on the Navajo Nation," the President said after signing into law the Diné Natural Resources Protection Act of 2005. "I believe the powers that be committed genocide on Navajoland by allowing uranium mining."

The President signed the bill at the Crownpoint Chapterhouse before a crowd of 50 thankful elderly and young Navajos who have fought against uranium mining for a decade.

He said many Navajo medicinemen and women and hundreds of Navajo uranium miners have died as a result of exposure to radioactivity and uranium, whether by mining, dust, contaminated water or contaminated livestock. Many other families continue to live with this painful and deadly legacy of the Cold War, he added.

"I don't want to subject any more of my people to exposure, to uranium and the cancers that it causes," he said. "I believe we reinforced our sovereignty today."

The uranium prohibition is needed to address the deadly legacy of past uranium mining and processing on Navajo lands, and to protect the economy, environment and health of the Navajo people from future uranium mining and milling, the President said.

Source:
http://www.sric.org/uranium/Navajo%20pres.%20signs%20uranium%20ban,%20for%20April%2030.pdf