

ARSENIC - YELLOWKNIFE

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Following the discovery of gold at Yellowknife, three major gold mines developed. Two are located on the perimeter of the city while the third, Discovery Mine, (230 ton mill operated January 1950 to April 1969) is located some distance north of the city at Giauque Lake. The two active mines in the immediate vicinity are Giant Yellowknife Mines (1000 ton mill) and the Con Mine (500 ton mill), a subsidiary of Cominco, which came into production in 1938. At the Con Mine, approximately 80% of the gold is extracted by a cyanide flotation process, a roasting process being used only to recover gold from the residue. Smoke containing arsenic is a by-product of the roasting process. At the Con Mine, arsenic is removed from the smoke by the impinger method which is about 85% efficient. The effluent is circulated through a slurry basin, a natural rock basin with a concrete dam at one end. There is believed to be little leakage or overflow. Smoke from the Con Mill usually blows out over Great Slave Lake due to the prevailing northerly winds.

At the Giant Yellowknife group of mines the gold is bound so intimately with sulphides that it cannot be extracted by the cyanide process and 100% of the ore is roasted. Smoke containing arsenic has been falling on the surrounding countryside since 1949. Since 1950 however, the smoke has been washed and since 1954 bag collectors have also been employed to remove particulate material. The washings go to a tailings pond. At Giant Yellowknife Mines the cleansing of the smoke runs between 98% and 99.7% efficiency. These measures reduced the gaseous and particulate arsenic emitted from the stacks to approximately 750 to 1000 pounds per average day or 135 to 235 tons per year.

At Giant Yellowknife Mines the tailings pond overflows periodically into Yellowknife Bay which was the source of water for the city of Yellowknife. To avoid



this pollution, the intake for city water supply, which also supplies the two mines, was moved to the mouth of the Yellowknife River and the discharge from the tailings pond into the bay has been controlled to some extent by construction of better berms. Lime precipitation of arsenic from the tailings has reduced the amount of dissolved arsenic reaching Yellowknife Bay, which is now maintained below 0.05 milligrammes of arsenic per litre. Fish taken from Great Slave Lake show minimal amounts of arsenic well below the permissible levels of 5 parts per million.

Bi-monthly monitoring of domestic water supplies from several sources is carried out routinely. The arsenic level in the source of city water (i.e. the Yellowknife River) has consistently been less than the recommended limit of 0.01 milligrammes per litre.

At various times there have been small market gardens in the Yellowknife area, but it is believed that none exist today. If the soil, used for gardening purposes, were heavily contaminated with arsenic as a result of years of fall-out, a series of analyses would be advisable for locally grown vegetable produce to determine its arsenic content, not only in vegetable cores, but also on vegetable surfaces, prior to washing. According to recent tests, vegetables grown in some locations showed arsenic values within acceptable limits while others analysed in an unwashed state held, in a few instances, up to 4 parts per million arsenic, which would be up to 4 times the maximum acceptable level if this were the chief source of vegetables. Such is not the case however, since most vegetables are imported.

The 1967 Yellowknife survey has not proven the existence of any significant or harmful effects of the arsenic pollution on the health of the general public. It demonstrated, however, the occurrence of lesions of the skin and mucous membranes of the nose among certain individuals who were exposed to arsenic at work (mill workers).

The most effective measures which have been taken to date are:



- (1) washing smoke and trapping arsenic particles to prevent a high percentage from being emitted from the stacks;
- (2) removal of the city water intake from Yellowknife Bay to the mouth of the Yellowknife River;
- (3) lime precipitation of arsenic and improved berms to reduce overflow from Giant Yellowknife tailings pond to Yellowknife Bay.

Since no market gardens are active at present, arsenic in vegetables offered for sale should not present a problem. Vegetables grown in private plots should be washed before consumption and checked periodically for arsenic.



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