



Frequently Asked Questions

Arsenic Levels in Soil, Sediments and Lakes around Yellowknife

1. Where does the arsenic in the Yellowknife area come from?

Arsenic is found at naturally low levels in the soil, sediments and water in some parts of the NWT. However, past gold mining activities have resulted in additional arsenic being released into the immediate environment surrounding the city.

2. Are these arsenic levels in the water dangerous?

Trace amounts of arsenic detected in the Yellowknife River and Yellowknife Bay, as well as in a majority of the lakes tested (green dots as shown on the public health advisory map), are below Health Canada's Guidelines for Canadian Drinking Water Quality. These results are similar to arsenic levels found in water supplies across Canada. Several lakes have arsenic levels above the national drinking water guidelines but are not high enough to pose a human health risk for recreational activities in the lake (yellow dots).

This public health advisory is meant to address concerns of high levels of arsenic in various parts of the environment around Yellowknife, including the lakes that have elevated arsenic levels (orange, red and purple dots i.e., over 52 parts per billion or 'ppb') and require some precautions, particularly for vulnerable populations such as pregnant women and very young children.

This public health advisory provides advice based on open water (i.e. not winter/under ice) dissolved arsenic levels, unless winter values are the only information available. In smaller water bodies, ice freezing may increase the concentration of arsenic in the underlying water; however there is little to no exposure to the public from these small, frozen lakes. In larger lakes, we have not seen significant increases in arsenic levels when the ice freezes.

3. Is the tap water in Yellowknife safe to drink?

Yes, Yellowknife's tap water is safe to drink. Residents of Yellowknife, N'dilo and Dettah receive their tap water from the City of Yellowknife. The drinking water is collected from the Yellowknife River upstream of the former Giant Mine, before the river enters Yellowknife Bay.

The City of Yellowknife also occasionally draws water directly from Yellowknife Bay when maintenance on the water pipe is required. Yellowknife Bay is tested regularly for arsenic and has consistently shown arsenic levels below the Guidelines for Canadian Drinking Water Quality (GCDWQ). Testing of treated water from Yellowknife Bay has shown that this practice does not affect the quality of our drinking water, including the arsenic levels.

Regardless of water source, levels of arsenic in drinking water for the communities of Yellowknife, N'dilo and Dettah remain below the limits set in the Guidelines for

Canadian Drinking Water Quality. This also includes trucked water which comes from the same source.

4. Is it safe to drink water from lakes (including frozen lakes) surrounding Yellowknife?

It is recommended not to drink untreated water anywhere in the NWT, primarily because of harmful microorganisms (germs such as E. coli, Giardia, Cryptosporidium and viruses) in untreated water that could make people sick. Individuals may, on occasion, boil water taken from lakes for personal use; however it is recommended to avoid doing so in lakes close to historical or active industrial activities. Boiling water, while killing harmful microorganisms, does not remove contaminants such as arsenic.

As the Chief Public Health Officer receives new data from research or monitoring studies, the map of affected lakes/area of interest and the associated health advice will be updated and the public notified.

It is also important to note that none of the affected lakes represented on the public health advisory map are sources of drinking water for Yellowknife, N'dilo or Dettah.

5. Is the water safe for recreational use in lakes surrounding Yellowknife?

Yes. Based on available arsenic data, most of the lakes near Yellowknife remain safe for recreational use such as swimming, boating and fishing. Public health advice in the advisory will be updated as data generated from research and monitoring studies is assessed by the Chief Public Health Officer.

Health risks associated with arsenic exposure depend on the mode of exposure (ingestion, inhalation or skin absorption), the concentration of arsenic and the form of arsenic. The advisory recommends that lakes with arsenic concentrations in water greater than 52 ppb (orange, red, or purple dot) not be used for regular recreational activities such as swimming or wading.

As an additional precaution, fish caught from such lakes should not be consumed but catch-and-release fishing can be done. The eating of sediments from all lakes should also be avoided.

Occasionally, there may be other reasons why a lake should not be used recreationally (e.g. blue-green algae). The Chief Public Health Officer will advise the public on any additional health risks from recreational water use separately from this public health advisory.

6. Has there been a human health study on the effects of arsenic around Yellowknife?

Since 2000, several human health risk assessments have been completed by the Giant Mine Remediation Project Team (GMRP) to determine the health risks from arsenic contamination associated with Giant Mine. This includes a Tier 2 Risk Assessment completed by SENES Consultants in 2006, which was updated in 2010. No significant public health concerns were identified at the time. However, the Mackenzie Valley Environmental Impact Review Board later determined that the risk assessment's conclusions were not adequately supported and that a comprehensive quantitative human health assessment was needed. This resulted in the GMRP contracting out a recent Human Health and Ecological Risk Assessment (HHERA), which was completed in January 2018 by Canada North Environmental Services Limited Partnership (CanNorth).

The HHERA looked at the presence of contaminants in the environment (specifically in country foods, soil, sediment and water) and evaluated the different ways that people could potentially be exposed to arsenic and other contaminants.¹ Arsenic was identified as the key concern.

The HHERA results indicated very low human health risk for arsenic exposure for Yellowknife, Ingraham Trail and Dettah residents and low human health risk for arsenic exposure for N'dilo residents. The very low human health risk level is similar to the risks associated with getting medical x-rays performed, while the low human health risk level is similar to the risks associated with getting a partial CT scan. Soil and dust are the main contributors to exposure for N'dilo residents.

The Giant Mine Remediation Project is currently conducting the following initiatives focused on human health:

1) The Health Effects Monitoring Program (HEMP) - Ongoing

The purpose of the HEMP is to make sure that the remediation activities to take place at Giant Mine will not have a negative impact on people's health. Specifically, it will establish current or baseline levels of arsenic exposure among residents in N'dilo, Dettah, and Yellowknife before remediation work begins. Then, during remediation, new monitoring results will be compared to the baseline to ensure that participants' arsenic levels are not increasing because of work being done at Giant Mine.

The HEMP includes participants from N'dilo, Dettah, and Yellowknife and involves the collection of human biological samples, including toenail clippings, saliva, and urine.

¹ The HHERA evaluated current and future contamination risks (including any potential risks once remediation is complete), and discussed the potential health effects that may be associated with various levels of exposure to a wide range of contaminant sources (off-site contamination, the consumption of grocery store foods, etc.).

The HHERA assessed the residents of Yellowknife, Ingraham Trail, Dettah and N'dilo for a variety of exposure pathways (e.g. wading/swimming in Long Lake, consuming a country food diet, etc.). These individual exposure pathways are described further in this 'Frequently asked Questions' document.

The study looks at other factors that could affect exposure levels, such as age, gender, drinking water sources, fish and local produce consumption patterns, and lifestyle choices such as smoking.

Participants are selected either through statistically-supported random sampling or voluntary participation. Sampling began in the fall of 2017, and recruitment of participants for this long-term program will continue in the spring/summer of 2018.

2) Stress Study – Under Development

While the direct effects of arsenic exposure are being evaluated through both of the above-mentioned studies, Measure 10 of the Mackenzie Valley Environmental Impact Review Board's Environmental Assessment requires the Project Team to also evaluate the indirect effects of potential exposures to arsenic on wellness, including stress.

The scope of the stress study is still under development; however, it is anticipated that it will evaluate the indirect effects on health from stress related to the possibility of arsenic exposure. It will include consultation with affected community members (in focus groups) to develop a survey for the measurement and analysis of stress effects.

7. Can playing on the shorelines cause the release of arsenic into the water?

The HHERA reported that wading in near-shore sediments in Yellowknife Bay including near N'dilo and Dettah, does not increase the human health risk due to low arsenic exposure. Additionally, although wading in near-shore sediments at Long Lake (not including the beach area) is noted to slightly increase arsenic exposure due to the use of the maximum measured concentration, the human health risk is still estimated to remain in the very low range.

8. How safe is it to swim at Long Lake?

Residents can continue to enjoy recreational activities at Long Lake. Long Lake is one of the lakes in which arsenic levels in water are below the 52 ppb threshold that has been set for caution (yellow dot on public health advisory map). Over the years, sand has been routinely added to the beach area, effectively covering the natural sediment layer and further reducing concerns about arsenic exposure. It is also not a source of drinking water.

9. Is it safe to swim along the shore in N'dilo and Latham Island?

Yes. Residents can continue to enjoy local areas of Great Slave Lake for all types of recreational activities without restrictions.

Results on water from Yellowknife Bay and Back Bay have consistently been well below national drinking water guidelines for arsenic.

The recent HHERA also assessed wading in near-shore sediments in N'dilo and Latham Island and found that it did not increase the human health risk due to overall low arsenic exposure.

10. Is it safe to use Frame Lake for recreational activities?

Residents can continue to enjoy paddling on the lake and using the Frame Lake trail and nearby parklands. Frame Lake is identified as having arsenic levels above 100 ppb (red dot on public health advisory map). Studies done in the past had already indicated a significant level of arsenic contamination in the sediment of Frame Lake. Swimming in Frame Lake was not assessed in the recent HHERA. It is advised not to use Frame Lake for swimming or harvesting of nearby berries and other edible plants.

11. Is it safe to eat fish from lakes in the Yellowknife area?

Based on contaminants studies that have been done to date and the recent HHERA results, fish from Back Bay and Yellowknife Bay are considered safe to eat. Until additional information becomes available, the advisory currently recommends avoiding eating fish from lakes with arsenic levels above 52 ppb.

12. Is it safe to swim or eat fish from Jackfish Lake?

Fish caught in Jackfish Lake should not be consumed. Jackfish Lake is identified as having arsenic levels that require some caution with regard to recreational activities (above 52 ppb, orange dot on public health advisory map). In 2015, blue-green algae were identified in the lake. Some types of algae have toxins that can cause bad rashes and other health problems. As a precautionary measure, people should avoid skin contact with the water (such as wear rubber gloves when handling fish) from any lake where blue-green algae are visibly present.

13. Is it safe to swim at Kam Lake?

It is advised not to use Kam Lake for swimming, or harvesting of nearby berries or other edible plants. Kam Lake is identified as having arsenic levels above 100 ppb (dark red dot on public health advisory map), based on recent monitoring data. Residents can continue to enjoy paddling on the lake or walking through the area.

14. Is it safe to swim at Niven Lake?

Niven Lake was formerly used as a sewage lagoon, so it is not recommended to swim in the lake or harvest berries and other edible plants from the surrounding area. Niven Lake is identified as having arsenic levels above 10 ppb (yellow dot on the public health advisory map), but below the 52 ppb threshold that has been set for caution.

15. Is it safe to swim at Grace or Range Lake?

Residents can continue to enjoy recreational activities, like swimming and fishing, at Grace and Range Lake. These lakes are identified as having arsenic levels above 10 ppb (yellow dots on public health advisory map), but below the 52 ppb threshold that has been set for caution.

16. Is it safe to eat wild berries and other plants around Yellowknife?

The recent HHERA reported that eating berries and wild plants harvested in the Yellowknife area (including N'dilo) does not pose a human health risk due to the low levels of arsenic in the berries and the low amount of berries consumed.

Although current information suggests it is unlikely that the occasional consumption of berries and wild plants would pose any significant human health risks, the public is nonetheless advised to avoid harvesting wild berries or other edible wild plants within city limits due to the wide range of human and industrial activities having taken place there over the past several decades. (See "area of interest" on the public health advisory map).

In general, people should pick berries and wild plants in locations that are well away from historic and current industrial activities and roadways.

Public health advice will be updated as new data generated from research or monitoring studies is assessed by the Chief Public Health Officer.

17. Is it safe to eat mushrooms around Yellowknife?

The recent HHERA reported that eating mushrooms harvested at distances greater than a 25 km radius from Giant Mine does not pose a human health risk from exposure to arsenic. Mushrooms harvested within 10 km to 25 km pose a very low risk from arsenic exposure. However, mushrooms should not be eaten within 10 km of Giant Mine.

The mushroom family *Tricholomataceae* (which includes Tricholoma, Clitocybe and White Matsutake classifications of mushrooms) tends to accumulate higher levels of arsenic. Therefore, mushrooms from the *Tricholomataceae* family should not be eaten within 25 km of Giant Mine.

18. Is it safe to eat garden vegetables grown in the Yellowknife area?

There has been no evidence to date that demonstrates garden vegetables grown within the City of Yellowknife, N'dilo and Dettah pose a risk for human consumption. A risk assessment was carried out by the Royal Military College in 2001 to evaluate the risk from consuming produce from Yellowknife gardens. They found that although garden vegetables may have arsenic concentrations higher than those bought in the supermarket, there was no significant increase to total daily intake of arsenic, and therefore no increased health risk.

As a precaution, imported soil that has been tested for trace metal levels could be used in gardens that will grow produce for consumption. If you are buying soil from a local source provider, inquire whether it is from an area that has been impacted by industrial activities and/or whether the soil has been tested and deemed acceptable for

agricultural purposes. Be sure to wash all produce thoroughly prior to eating to remove any soil.

19. Does arsenic in dust affect the air quality in the Yellowknife area?

Elevated dust can affect the air quality in Yellowknife, regardless of whether it has arsenic or not. Exposure to dust can cause health problems or make current health conditions worse, such as asthma or other chronic respiratory problems.

The GNWT operates four state-of-the-art continuous ambient air quality monitoring stations across the Northwest Territories. Stations are located in Fort Smith, Inuvik, Norman Wells and Yellowknife. Each of these stations sample and analyze air quality on a continuous basis for a variety of parameters including dust and chemicals. The network is part of the National Air Pollution Surveillance Network (NAPS), a federal program operated across the country

The Air Quality Monitoring Program, which is part of the Giant Mine Remediation Project, is set up to monitor local air quality so that remediation activities at Giant Mine do not cause adverse effects to people or the environment. The three tier approach to monitoring includes site activity specific monitoring, fenceline (lease boundary) and community stations at three locations (Ndilo, Niven area, and the Marina). These monitoring stations measure concentrations of contaminants in the air such as arsenic. When monitors detect elevated levels, site personnel take action by informing team members, watering to suppress dust, modifying or stopping work, and investigating to look for the cause (which may be off-site from the Giant Mine). Giant Mine also administers regular preventative dust suppression activities on-site.

The recent HHERA did not report any health risks associated with inhaling air containing arsenic for local residents, as the concentration of arsenic in the air is very low.

20. Can arsenic be absorbed through the skin?

Arsenic is not absorbed in any significant amounts through the skin. Significant exposure can only occur through regular ingestion or inhalation. Walking or hiking through a contaminated area does not constitute a risk in and of itself.

21. Why is there no detailed map related to surface soil arsenic levels in Yellowknife?

Over the last three years, the GNWT provided funding to Queen's University to conduct surface soil sampling in the Yellowknife region. Results showed that contaminant levels can be very different in soil samples that are taken from locations very close to each other (e.g. within a few meters). For this reason, it is difficult to draw general conclusions about contaminant levels of soils for a given area, and a challenge to define a boundary. Because of this high variability in soil contaminants results, the Chief Public

Health Officer is providing general precautionary advice for land-based activities such as gardening and recreational activities. The public health advisory map has shaded land areas (see “area of interest”) around lakes with high arsenic concentrations and where there are high arsenic soil concentrations. Berry picking and harvesting of wild plants and mushrooms should be avoided in these areas, and soil should not be used for gardening. For more specific information about arsenic concentrations in Yellowknife surface soil, download the Queen’s report from the NWT Geological Survey website (<http://www.nwtgeoscience.ca>).

22. What are the health risks associated with arsenic-containing soil in Yellowknife?

The HHERA included an assessment of risk to human health from arsenic in soil from several areas including the City of Yellowknife, Ingraham Trail, Latham Island, Ndilo and Dettah. Through the evaluation of a number of exposure pathways, the HHERA concluded the risk was very low for Yellowknife and Dettah residents and low for N’dilo residents.

Areas with arsenic in surface soil are outlined in the “area of interest” on the public health advisory map (see Question 24 for more information). The map compares soil concentrations to the GNWT residential and industrial arsenic criteria. Studies are ongoing to determine the potential impact of these arsenic levels in soils and the Chief Public Health Officer will continue to update health messaging based on these studies.

23. How does HSS notify the public of any risks associated with contaminants in soil, sediments, water, fish, etc.?

Public health advice is provided to residents through a public health advisory or consumption notices which assist the public in making decisions about consuming country foods. Advisories and consumption notices are issued by the Chief Public Health Officer. This information is circulated to community governments, media and the public, and is posted on the Department’s website in the newsroom section.

Other stakeholders, such as the City of Yellowknife or the Department of Industry, Tourism & Investment, may decide to post signs in locations with elevated contaminant levels, particularly in areas of regular public use, such as parks and trails. Other agencies may choose to include information in other publications, such as the NWT Fishing Guide issued by the Department of Environment and Natural Resources.

The Chief Public Health Officer will continue to update health messaging based on the latest available research and monitoring, and will continue to work with partners to keep the public informed.

24. What is the “area of interest” shading on the public health advisory map?

The area of interest is defined as an area of land adjacent to water bodies with elevated arsenic levels (52 ppb or higher), in close proximity to a mine site, or with high arsenic

soil concentrations. There is currently one large area of interest that includes land near Giant Mine and Con Mine.

The first iterations of the public health advisory map included an area of interest around lakes with high arsenic levels, as a precaution. However, surface soil data from recent studies has resulted in the expansion of the area of interest. Berry picking and harvesting of wild plants and mushrooms (up to 10km) should be avoided in these areas, and soil should not be used for gardening. Walking through this area does not pose a health hazard.